CIMRON
DIVISION

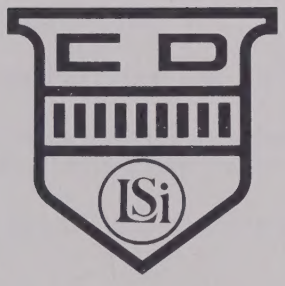
# CIMRON DIVISION
# CUSTOMER SERVICES
# INFORMATION

LEAR SIEGLER, INC. / LSi

CIMRON DIVISION

CUSTOMER SERVICES

INFORMATION




CIMRON DIVISION of LEAR SIEGLER, INC.

1152 Morena Blvd., San Diego, California 92110

Area Code 714 - Phone 276-3200 - TWX 910-335-1196

# MANUAL CHANGE

MANUAL AFFECTED: Cimron Division Customer Services Information

CHANGE NO. 1 DATE: July 15, 1967

REASON FOR CHANGE: To Incorporate New Information.

1. Replace the following pages with the enclosed new pages:

   a. First two pages of the cover letter, dated November 1, 1966.

   b. REPAIR PARTS KIT FOR 7000 SERIES DIGITAL VOLTMETERS CIMRON PART NUMBER 5-40027.

   c. PRICE LIST FOR INDIVIDUAL SPARE PARTS & ASSEMBLIES CIMRON 7000 SERIES DIGITAL VOLTMETERS.

   d. PRICE LIST FOR INDIVIDUAL ASSEMBLIES AND SPARE PARTS CIMRON 7600 SERIES DIGITAL VOLTMETERS.

   e. PRICE LIST FOR INDIVIDUAL ASSEMBLIES AND SPARE PARTS CIMRON 8000B SERIES DIGITAL VOLTMETERS.

   f. PRICE LIST FOR INDIVIDUAL SPARE PARTS & ASSEMBLIES CIMRON 9000 SERIES DIGITAL VOLTMETERS.

2. Insert the following new pages as indicated:

   a. Field Service Bulletin 117 - last item in 7000 SERIES Appendix.

   b. Maintenance and Calibration of Cimron P9000B Series Digital Volt and Volt-Ratio Meters (DVM) - in 9000 Series Appendix following page titled "9000 SERIES DIGITAL VOLTMETERS PRICE LIST (Cont'd)".

   c. Field Service Bulletin 118 - last item in PLUG-IN ACCESSORIES Appendix.

3. Enter the following changes:

   a. Page following cover letter, titled "DESIGNED FOR SERVICE", second paragraph, second sentence - change RMS to EIA.

   b. Change the effective date of all Repair Parts Kit pages, except 7000 Series, to July 15, 1967.

   c. In 7600 SERIES Appendix, on REPAIR PARTS KIT FOR 7600 SERIES DIGITAL VOLTMETERS CIMRON PART NUMBER 5-40025, page 2 - change 18V Printact, 7-38214 to 13V Printact, 7-38215.

CIMRON DIVISION

LEAR SIEGLER, INC. LSi

MORENA BOULEVARD SAN DIEGO, CALIFORNIA 92110 714 • 276-3200

July 15, 1967

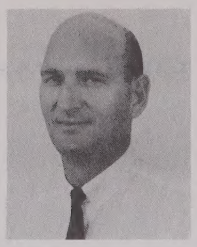
Dear Customer:

This booklet is provided to Cimron customers as one of the services offered by the Cimron Customer Relations Department, your representative within the Cimron Division of Lear Siegler, Inc.

Believing "Customer Concern" to be the keynote for satisfied customers, we have listed in the booklet some of the many services offered.

Supplementary information for specific instrument models is contained in appendixes to this booklet. The information will assist you, the customer, in understanding and maintaining your equipment.

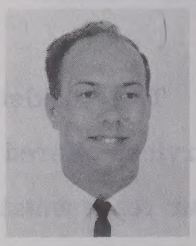
Presented herewith are the individuals who do their utmost to make, and keep, the customer satisfied with Cimron products and services.



Don Meyer, Director
Customer Relations

Kai Persson, Supervisor
Customer Services

Chuck Hasley,
Field Engineer



Tom Green,
Field Engineer

Diane Haenning,
Expediter

Don, Kai, Tom, and Chuck combine experience in excess of 20 years in the specialized area of digital voltmeters. In the last year they traveled a total of approximately 225,000 miles on behalf of Cimron customers.

Diane maintains liaison between production control, material control, and the accounting department. Her assignment is to ensure accuracy and promptness in filling, invoicing, and shipping a customer's order for spare parts.

## DESIGNED FOR SERVICE

Anticipating service requirements of Cimron customers, our concern for service begins with the design concept of the product.

You will find Cimron instruments are constructed from plug-in modules or assemblies for simplicity of service. The "designed for service" concept is carried even further by the marking of connections to identify circuit association; the use of RMA color coding of wire for ease of circuit tracing; the printed calibration and adjustment procedures on inside covers; the providing and identifying of pertinent test points for use of signal tracing; and the instruction manual accompanying the instrument. The instruction manual is written with service and maintenance as a theme.

Just as our concern for service does not begin with the sale of an instrument, neither does it end there. Each Cimron instrument is accompanied by a standard warranty. The mechanics of a warranty are not new but perhaps our interpretation as a customer service group is new. Properly implemented, this can be your warranty of satisfaction. Service requirements brought to our attention receive immediate consideration and are resolved as expeditiously as possible. Highly skilled technical assistance is as near as your telephone and parts are only hours away in this modern jet-age.

For the convenience of customers who may wish to utilize the plug-in concept to minimize down time of instruments, repair parts kits are made up for individual instrument models. The contents of these kits have been selected, from experience based on established maintenance records, to fulfill most maintenance requirements which may occur in a year's time.

As you will note, the kit contains not only spare assemblies and repair parts but troubleshooting equipment such as a circuit logic tester and extender boards. A listing of contents, together with part numbers and prices, of the kit pictured above can be found in the 7000 Series appendix. Repair kits for other Cimron series of instruments can be found in the applicable appendixes. A complete kit or any specific part or parts for your equipment can be ordered from the Customer Relations Department of Cimron.

# CUSTOMER SERVICES

The Customer Relations Department is responsible for providing to you, the customer, the services hereinafter described.

PUBLICATIONS - Documentation for Cimron instruments begins in the breadboard stage of development. The end result of the documentation is a comprehensive operation and maintenance instruction manual that accompanies the completed instrument.

Instrument improvements and engineering changes that affect Cimron instruments are reported to the customer via field service bulletins and instruction manual change notices.

Supplementary information such as the service notes contained in this booklet is generated as a service to the customer.

FACTORY REPAIR - The repair section of the Customer Relations Department offers repair service for all customer-owned instruments of Cimron manufacture. Instruments returned to Cimron for repair receive the attention of highly skilled technicians. The technicians are familiar in every respect with Cimron products and are supported by test and calibration equipment of the same high quality as the equipment used in the manufacture of Cimron instruments. Quality and promptness are an axiom in this area.

TECHNICAL ASSISTANCE - Technical assistance is as near as your telephone. Most customer requirements can be satisfied by a telephone call to the Cimron Customer Relations Department.

A staff of field engineers, familiar with all Cimron products and procedures, can by telephone:

a. Discuss your needs and requirements.

b. Advise on instrument application.

c. Diagnose instrument symptoms and advise corrective action, furnish parts as necessary for repair, or recommend factory repair.

d. Arrange for training visits by field engineers.

e. Arrange for formal training.

f. Arrange for a visit by a field engineer to discuss any of the above subjects in greater detail or any other pertinent subject.

## APPENDIXES

Included in the appendixes are recommended parts kits, spare parts lists and prices, field service bulletins, logic descriptions and service notes for Cimron Series instruments. The parts kits, parts lists and field service bulletins are formal documents published by the Cimron Customer Relations Department. The logic descriptions and service notes are a collection of informal documents in their original form as written by our field engineers to assist individual customers. The parts kits appear as the first item in each appendix. The quoted prices will remain firm for at least six months.

REPAIR PARTS KIT FOR 7000 SERIES DIGITAL VOLTMETERS

CIMRON PART NUMBER 5-40027

| Quantity | Item | Part Number |
|---|---|---|
| 1 | Attenuator & Preamplifier Assembly | 70-6006 |
| 1 | Amplifier Assembly | 70-6009 |
| 1 | Logic Driver Assembly | 70-6008 |
| 1 | Logic Matrix Assembly | 70-6001 |
| 1 | Range & Polarity Assembly | 70-6007 |
| 1 | 10K Decade Assembly | 70-6003 |
| 2 | Units Thru 1K Decade Assembly | 70-6002 |
| 1 | Remote Function Assembly (Specify -1 or -3) | 70-6005 |
| 1 | Power Supply Assembly | 70-6004 |
| 1 (Set) | "A" Potentiometer Assembly | 70-6012 |
| 1 | "B" Potentiometer Assembly | 70-6013 |
| 1 | Voltage Reference Assembly (Replaces 70-6111) | 70-6140 |
| 1 | Logic Tester Assembly | 70-9504 |
| 1 | Extension Board Assembly | 70-9501-1 |
| 1 | Extension Board Assembly (Potentiometer) | 70-9502-3 |
| 1 | Extension Board Assembly (Reference) | 70-9503-1 |
| 2 | Fuse, 3AG S-B 1/2A | 4-08013 |
| 1 | Numeral Neon Indicator | 3-41403 |
| 1 | Polarity Neon Indicator | 3-41402 |
| 1 | Chopper | 70-0505-1 |
| 1 | Input Cable Assembly (Specify DVM Model) | 60-5007-3 |
| 2 | Coil Reed Switch Actuator | 70-0501-1 |
| 1 | Coil Reed Drive | 70-0502-1 |
| 10 | Reed Relay | 7-38208 |
| 2 | Reed Relay | 7-38216 |
| 1 | 7000 Series Instruction Manual | |
| 1 | Spare Parts Kit Case | |

THIS KIT IS PRICED AT $3,295.09.

Effective July 15, 1967

PRICE LIST FOR INDIVIDUAL SPARE PARTS AND ASSEMBLIES

CIMRON 7000 SERIES DIGITAL VOLTMETERS

| ITEM | QUANTITY PER DVM | PART NUMBER | UNIT PRICE |
|---|---|---|---|
| Attenuator/Preamplifier Assembly | 1 | 70-6006 | $350.00 |
| Amplifier Assembly | 1 | 70-6009 | 192.00 |
| Logic Driver Assembly | 1 | 70-6008 | 250.00 |
| Logic Driver Assembly | 1 | 70-6108 | 250.00 |
| Matrix Assembly | 1 | 70-6001 | 73.00 |
| Range & Polarity Assembly | 1 | 70-6007 | 174.00 |
| Range & Polarity Assembly | 1 | 70-6107 | 174.00 |
| 10K Decade Assembly | 1 | 70-6003 | 230.00 |
| 10K Decade Assembly | 1 | 70-6110 | 230.00 |
| Units Decade Assembly | 4 | 70-6002 | 177.00 |
| Units Decade Assembly | 4 | 70-6109 | 177.00 |
| Remote Function Assembly | 1 | 70-6005-1 | 89.00 |
| Remote Function Assembly | 1 | 70-6005-2 | 58.00 |
| Power Supply Assembly | 1 | 70-6004 | 124.00 |
| Print Control Assembly | 1 | 70-6014 | 132.00 |
| Print Control Assembly | 1 | 70-6114 | 132.00 |
| Reference Assembly | 1 | 70-6140 | 152.00 |
| "A" Pot Assembly (Matched Pair) | 1 | 70-6012 | 629.00 |
| "B" Pot Assembly | 2 | 70-6013 | 195.00 |
| Dn Range Assembly | 1 | 70-6021 | 31.00 |
| Extension Board | 1 | 70-9501-1 | 60.00 |
| Extension Board | 1 | 70-9502-3 | 50.00 |
| Extension Board | 1 | 70-9503-1 | 28.00 |
| Logic Tester | 1 | 70-9504 | 110.00 |



Effective July 15, 1967

| ITEM | QUANTITY PER DVM | PART NUMBER | UNIT PRICE |
|---|---|---|---|
| Chopper | 1 | 70-0505-1 | $100.00 |
| Reed | 12 | 7-38208 | 1.50 |
| H.V. Reed | 1 | 7-38211 | 3.88 |
| CT20 | 1 | 9-04701 | 1.25 |
| CT21 | 1 | (Use CT26) | |
| CT22 | 1 | 9-04705 | 2.50 |
| CT23 | 2 | 9-04706 | 1.38 |
| CT24 | 1 | (Use CT25) | |
| CT25 | 1 | 9-04709 | 2.00 |
| CT26 | 1 | 9-04710 | 1.75 |
| 2N404A | 1 | 9-04609 | .88 |
| 2N1261 | 1 | 9-04610 | 6.50 |
| 2N1309 | 1 | 9-04611 | 1.63 |
| 2N1304 | 1 | 9-04500 | .93 |
| CD61 | 4 | 7-95511 | .33 |
| CD62 | 4 | 7-95507 | .40 |
| 40MF/250V | 1 | 1-57214 | 1.83 |
| 1000MF/25V | 1 | 1-57212 | 4.35 |
| 500MF/50V | 2 | 1-57213 | 2.78 |
| 100MF/25V | 1 | 1-57206 | .90 |
| 50MF/50V | 1 | 1-57210 | .80 |
| Numeral Indicator | 1 | 3-41403 | 20.63 |
| Polarity Indicator | 1 | 3-41402 | 20.63 |



Effective July 15, 1967

CIMRON 7000 SERIES DIGITAL VOLTMETERS

DESCRIPTION OF LOGIC

The following is a detailed description of the logic used in the CIMRON 7000 Series Digital Voltmeters. Each logic control line is also described in detail, and formulas are supplied for all possible combinations. Please refer to the schematic on the Logic Matrix Assembly (Dwg 70-0701) which will be used in this discussion.

The Matrix is divided into three sections, "Up", "Fast Up", and "Down". The input and output signals appear on the bottom of the schematic, and the control lines appear on the right. A thorough knowledge of the control lines is mandatory to understand the operation of the matrix. The following is a description of all control lines beginning at the top.

S9-1 (Shift 9, Units) This line is unclamped from DVM common when the units decade steps to 9 and then receives one more up pulse.

S0-1 (Set Zero, Units) This line is unclamped from DVM common at zero. It is clamped to DVM common on 1 thru 9. Q212 on the units decade assembly is cut off at zero.

S9-10 (Shift 9 - Tens) Same as S9-1 except it applies to the tens decade.

$\overline{\text{S9-10}}$ (Not Shift 9 - Tens) This line is clamped to DVM common at S9 only. Q223 is normally open, but conducts when S9-10 is unclamped.

S0-10 (Set Zero, Tens) Same as S0-1, except applicable to the tens decade.

S9-100 (Shift 9 - 100's) See S9-1. Applicable to 100's decade.

$\overline{\text{S9-100}}$ (Not Shift 9 - 100's) See $\overline{\text{S9-10}}$. Applicable to 100's decade.

S0-100 (Set Zero - 100's) Same as S0-1 except applicable to the 100's decade.

S9-1K (Shift 9 - 1K) Same as S9-1 except applicable to the 1K decade.

$\overline{\text{S9-1K}}$ (Not Shift 9 - 1K) Same as $\overline{\text{S9-10}}$ except applicable to the 1K decade.

S0-1K (Set Zero, 1K) Same as S0-1, applicable to the 1K decade.

S9-10K (Shift 9 - 10K) Same as S9-1 except applicable to the 10K decade.

$\overline{\text{S9-10K}}$ (Not Shift 9, 10K) Same as $\overline{\text{S9-10}}$ except applicable to the 10K decade.

S1-10K (Set 1, 10K) This is peculiar to the 10K decade. This line is unclamped when a 1 appears in the 10K decade. It is clamped to DVM common for all other digits including zero. Q313 is open when a 1 appears in the 10K decade.

$\overline{\text{S1-R}}$ (Not Set - Range 1) This line is clamped to DVM common on Range 1 only. This is the 0.0000 to 9.9999 V range, sometimes called the fundamental range.

S1-R (Set Range 1) This is the complement of $\overline{\text{S1-R}}$. It is unclamped from DVM common on Range 1 only.

There are three pulses which enter the matrix from the bottom on the matrix schematic. These originate in the Logic Driver Assembly, and are -27 volts in amplitude, and 100 us in duration. They are labled "UP-IN", "F-UP-IN" and "DN-IN". The "DN-IN" pulse is inhibited from being present when a "UP-IN" or "F-UP-IN" pulse is present and conversely. This inhibition takes place on the Logic Driver Assembly.

Reading the bottom of the Matrix schematic from left to right, the following describes the function of the output lines.

UP-R (UP-Range) This is a -25v pulse which appears when the decades show "all nines" and one more UP pulse is received. This pulse does not go directly to the Range Polarity Assembly, but is directed to the Range Driver one-shot which is located on the Logic Driver Assembly. The Range Driver is used to delay the "UP-R" pulse so the attenuator input filter will have time to discharge between ranges.

UP-10K This pulse drives the 10K decade through a normal count but appears only when the four other decades have reached their S9 condition.

UP-1K This drives the 1K decade through a normal count and is the same as "UP 10K" but requires that the three lesser decades have reached their S9 condition.

UP-100 Same as UP-10K except applicable to the 100's decade. Its presence requires that the units and tens decade be in the S9 condition.

UP-10 Normal count for the 10's decade. Requires that the units decade be in the S9 condition.

UP-1 The incoming "UP-IN" pulse drives the units decade in a normal count.

UP-IN This has already been described.

The second group concerns the "FAST-UP" feature. This feature may be described as a logic short cut. The voltmeter will operate with the Fast-up circuitry removed. The Fast-up pulse originates on the Logic Driver Assembly, and is present when the input

voltage is higher than the voltage indicated on the readout by approximately 1300 digits. The result is that the three least significant decades are driven to "all nines" by six "F-UP" pulses instead of 33 pulses required by the normal logic. The definitions follow.

100-9 The hundreds decade is driven from zero to nine

10 -9 The tens decade is driven from zero to nine

1 -9 The units decade is driven from zero to nine

The Down logic is the most difficult of the three. The definitions are as follows:

DN-P This term is really a misnomer. A pulse on this line causes a polarity reversal.

DN-R (Down Range) A pulse on this line causes the range binaries to set to Range 1, the fundamental range. This will happen from the 100V or the 1000V range.

10K-0 The 10K decade is driven to zero from any number when a pulse appears on this line.

10K-1 The 10K decade is driven to 1 when a pulse appears on this line. This happens only when the range is in the 100 or 1000 volt range.

DN-1K A pulse on this line drives the 1K decade to zero from any count.

DN-100 A pulse on this line drives the 100's decade to zero from any count.

DN-10 A pulse on this line drives the 10's decade to zero from any count.

DN-1 A pulse on this line drives the units decade to zero from any count.

Notice the inset in the upper left corner showing the diode connected across two busses of the Matrix. The drive pulse, which is negative going, is fed to the vertical buss through a 2.2K or 4.7K resistor. The control signal appears on the horizontal buss, and, as previously mentioned, is a line which is unclamped from DVM common. Therefore, the drive pulse will appear on the vertical buss only if the control line is unclamped. With the above knowledge in mind, let us determine what happens when the voltmeter receives a series of UP pulses on the UP-IN line and has "all zero's" in the readout.

These pulses will attempt to appear on the UP-R, UP-10K, UP-1K, UP-100, UP-10 and UP-1 lines. But, for a signal to appear on the UP-R line, the 10, 100, 1K and 10K decades must be in S9.

UP-R = S910K . S91K . S9 . 100 . S910 . UP-IN
This condition is not met. Similarly

UP-10K = S91K . S9100 . S910 . UP-IN
This is also not met. And

UP-1K = S9100 . S910 . UP-IN
Still no go. An UP-10 requires S9-1 and an UP pulse. However, the UP-1 line has no diodes to control it, and UP pulses will appear. They will drive the units decade from zero thru 9 and then S9-1.

When S9-1 is present the UP pulses cause the 10's decade to count to 9 and then S9-10.

When S9-10 is present the UP pulses cause the 100's decade to count to 9 and then S9-100. The voltmeter reads +0.0999.

When S9-100 is present the UP pulses cause the 1K decade to count to 9 and then S9-1K.

When S9-1K is present the UP pulses cause the 10K decade to count to 9 and then S9-10K. The voltmeter is now reading +9.9999. The next UP pulse appears on the UP-R line and the voltmeter now shows +99.999. One more UP pulse and the voltmeter reaches its maximum, or 999.99 volts.

In actual operation, the application of a large input voltage causes the "F-UP" pulse and one UP-IN pulse drive the units decade to 9 and S9-1, at which time the 10-9 line is unclamped. Two more pulses drive the 10's decade to 9 and S9-10. When S9-10 is unclamped two more F-UP pulses drive the 100's decade to 9 and S9-100. The F-UP pulse is not used beyond the 100's decade, and the 1K & 10K decade counts normally.

The equations are:

(1) 100-9 = S9-1 . S9-10 . F-UP

(2) 10 -9 = S9-1 . F-UP

(3) 1 -9 = F-UP

The DN-P line is a polarity reversal. It requires a DN pulse and all decades to be at zero.

DN-P - S0-1 . S0-10 . S0-100 . S0-1K . S0-10K . DN-IN.

The DN-R line returns the range of the voltmeter to the fundamental range when a 1 appears in the 10K decade and the other decades are at zero.

DN-R = S1-10K . S0-1K . S0-100 . S0-10 . S0-1 . DN-IN.

10K-0 This line returns the 10K decade to zero from any number provided that the voltmeter is in its fundamental range and zeros are present in other decades.
10K-0 = S0-1 . S0-10 . S0-100 . S0-1K . S1-R . DN-IN.

10K-1 This line returns the 10K decade to 1 from any higher number provided that the voltmeter is not in its fundamental range and zeros are present in the other decades or the 10K decade is in a S9 condition.
10K-1 = S0-1K . S0-100 . S0-10 . S0-1 . DN-IN + S9-10K . DN-IN.

DN-1K This line returns the 1K decade to zero from any number provided that the 10K decade is not in a S9 condition and the 100's, 10's and units decade are in S0
DN-1K = $\overline{S9}$-10K . S0-100 . S0-10 . S0-1 . DN-IN
or the 10K decade is not in a S9 condition and the 1K decade is in a S9 condition
DN-1K = $\overline{S9}$-10K . S9-1K.

DN-100 This line clears the 100's decade to zero provided that the 10K decades are not in a S9 condition and the 100's decade is in a S9 condition
DN-100 = $\overline{S9}$-10K . $\overline{S9}$-1K . S9-100 . DN-IN
or if the 10K and 1K decades are not in a S9 condition and the units and tens decade are at zero DN-100 = $\overline{S9}$-10K . $\overline{S9}$-1K . S0-10 . S0-1 . DN-IN.

DN-10 This line clears the 10's decade to zero provided that the 10K, 1K & 100's decades are not in the S9 condition and the 10's decade is in a S9 condition
DN-10 = $\overline{S9}$-10K . $\overline{S9}$-1K . $\overline{S9}$-100 . S9-10 . DN-IN
or the 10K, 1K and 100's decades are not in the S9 condition and the units decade shows a zero DN-10 = $\overline{S9}$-10K . $\overline{S9}$-1K . $\overline{S9}$-100 . S0-1 . DN-IN.

DN-1 This line clears the units decade to zero when all other decades are not in a S9 condition DN-1 = $\overline{S9}$-10K . $\overline{S9}$-1K . $\overline{S9}$-100 . $\overline{S9}$-10 . DN-IN.

# POTENTIOMETER ASSEMBLIES 7000 SERIES

The four potentiometer assemblies used in the Cimron 7000 series voltmeters are located on the left side of the voltmeter toward the rear. For purposes of this discussion they will be numbered "one", "two", "three", "four"; number one being in front. Number one assembly is called the "A Pot. Hi", number two the "A Pot. Low", number three the "B Pot. Hi" and number four the "B Pot. Low". Numbers one and two, although not identical, are interchangeable, and numbers three and four are identical and interchangeable. The reference voltage (10v) enters on the left side of #1 assembly. This voltage will measure 7 volts with respect to the DVM common on a 20KΩ/V meter, and will appear on the upper end of the left hand resistor. The reference voltage continues from left to right on the number one assembly, and then jumps to the right side of the number three assembly, where it continues to the left side. From here it jumps to the left side of the number four assembly, and this connection is the arm of the potentiometer. The circuit continues from the arm of the potentiometer to the right side of the number four assembly, jumps to the right side of the number two assembly, and ends at DVM common on the left side of the number two assembly. From the above it follows that all the reed switches in the number two and four assemblies are closed when all zeros show in the readout.

Each decade has four "bits", or voltages, and they are in the ratio of 2,4,2 and 1. In any decade one of the 2's remains in from number 2 thru 9, and it is identified by an asterisk (2*). The bits are controlled by four flip-flops on the decade assemblies. The flip-flops are identified in the manuals as A, B, C, and D. The counting is as follows:

| | A=2* | B=4 | C=2 | D=1 |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |
| 1 | 0 | 0 | 0 | 1 |
| 2 | 1 | 0 | 0 | 0 |
| 3 | 1 | 0 | 0 | 1 |
| 4 | 1 | 0 | 1 | 0 |
| 5 | 1 | 0 | 1 | 1 |
| 6 | 1 | 1 | 0 | 0 |
| 7 | 1 | 1 | 0 | 1 |
| 8 | 1 | 1 | 1 | 0 |
| 9 | 1 | 1 | 1 | 1 |

There are ten reed switches and the corresponding solenoids on each assembly. The locations of the bits on the B Potentiometer Assemblies numbers three and four, reading from left to right are as follows:

| # 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|
| 200 | 100 | 20* | 40 | 20 | 10 | 2* | 4 | 2 | 1 |

and on the A assemblies:

| # | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| | 20K* | 40K | 20K | 10K | 2K* | 4K | 2K | 1K | 200* | 400 |

The solenoids measure 1500Ω across the coil. A rapid check on all windings and the decoupling diodes is to measure from the +11 volt input with the positive probe of an ohmmeter to the cathodes of the decoupling diodes. This should measure 3200Ω on a Simpson 260 on the X100Ω scale. Each solenoid has a diode from one side of the winding to the "clamp" line. The "clamp" line is the same as the +11V line. Each solenoid also has an internal shield, which can be seen next to the reed switches. The shields are connected to DVM common, and it is a good practice to verify that this does happen, and also to verify that no winding is grounded to the shield.

Experience has shown that many voltmeter problems are attributed to defective reed switches. In many cases these problems are due to excessive sensitivity in the voltmeter to a change in input. Before attempting any service on the potentiometer assemblies, be sure that the voltmeter is adjusted so that it just counts with a change of 90 microvolts from a true null. The procedure is outlined in detail in the manual. A "Dekavider" or equivalent which has a potentiometer for the least significant digit is satisfactory. Experience has also shown that the sensitivity adjustments inside the voltmeter seldom need to be adjusted, unless a transistor has been changed.

The principal problems occurring in the reed switches are as follows:

(1) The reed won't close.

(2) The reed won't open.

(3) The reed has excessive resistance.

(4) Timing. (One reed changes faster than its complement)

(1) As previously mentioned, all reeds in the number two and four assemblies are closed when the readout shows all zeros. If, with the input leads shorted, the polarity indicator shows a + and - together, and the readout shows all zeros, this indicates an open reed in either the number two or the number four assembly . To locate the defective reed, use a short test lead and connect from the top of the left hand resistor to the top of the right hand resistor on each assembly. This is, in effect, connecting a jumper across supposedly closed reeds and the polarity indicator should now show one polarity. It will generally be found that the problem lies in the number four assembly. Now move one end of the test clip toward the center of the assembly, and then the other end, and continue until the polarity indicator again shows both + and - simultaneously. By backtracking one move the offending reed can be located, for each end of the reeds is connected to the top ends of the resistors on the assemblies. The defective reed will be the one below the right hand clip. The above procedure is enhanced if the error signal is watched as the test lead is moved, as reeds with an unusually high closed resistance

will cause a large change in the error signal. Check each assembly by interchange with its complement. Note that the left hand reed cannot be checked in the above manner, as the lower end of the reed does not appear on top of the assembly.

(2) A reed that won't open may be located by removing the suspected assembly from the voltmeter and checking all reeds with an ohmmeter. An assembly that contains a reed that won't open will show all zeros when in the number two or four position, and the input leads are shorted, but will not count properly past the defective reed. Knowing the counting sequence, the defective reed can be determined. A reed that won't open in the High Potentiometer Assemblies number one or three will cause a non-linear count.

(3) Excessive resistance in a closed reed switch can be verified as in (1). Connect a short jumper across the suspected reed, and observe the error signal in a scope. A large change in the error signal approaching one digit in amplitude will indicate a reed switch with excessive resistance. A good reed will, however, cause some change in the error signal due to inherent thermal voltages.

The reed switches in the potentiometer assemblies operate at 100 ua or less of current. For this reason it is not recommended to check the resistance of a closed reed switch using an ohmmeter and a magnet. Most ohmmeters on the R x 1 scale will pass 100 MA through the reed. This excessive current will alter the contact surfaces of the reed switch and may result in a temporary cure.

(4) A timing problem in the reed switches has been defined as a condition where one reed changes at a different rate than its complement. There is no problem of contact resistance here. Knowing the counting sequence of the decades it is easy to isolate this problem to one pair of reed switches. It will likely be one of the two reeds which causes the trouble, but the quickest repair is to replace both reed switches. However, do not discard the defective pair, as each reed switch will most likely operate satisfactorily with another. If no spare reeds are available, exchange the suspected pair with the pair in the 2* bit, for this bit is used much less than the others. Whenever a new reed switch is installed in an assembly, at least one-half hour should elapse before the assembly is operated in order to minimize thermal voltages induced by the heat of the soldering.

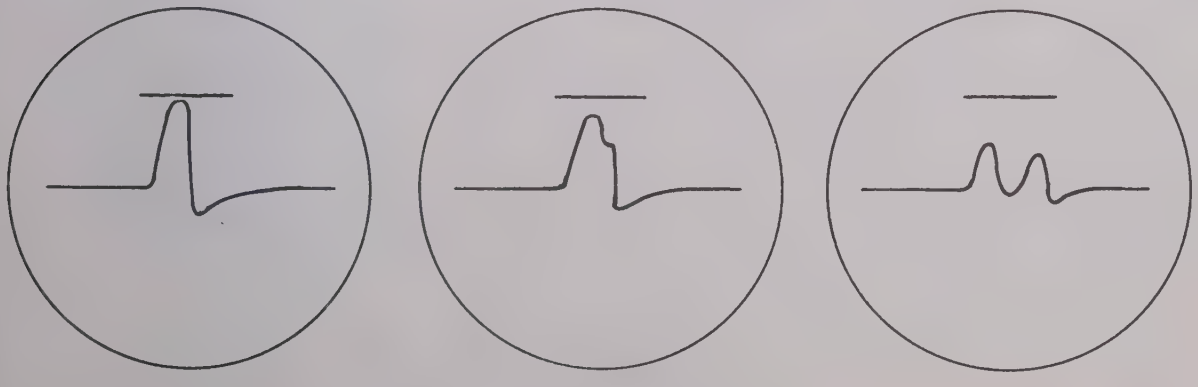
The following notes and the accompanying drawing are intended to assist the user of Cimron 7000 series voltmeters to verify the error signal and gate coincidence, and to check the condition of the chopper. A scope, preferably dual trace, and a stable D.C. source with a precision divider which has infinite resolution in the least significant digit are required.

The gate, which is a positive pulse of approximately 8 volts amplitude and 150us. width, can be varied in respect to the error signal by potentiometer R807, identified as "DELAY" on board #3. The error signal is one volt per digit and is a function of the contact closure of the chopper and therefore it can be used to determine the condition of the chopper.

Connect the scope as indicated in the drawing, with external sweep for 50us/cm. Observe the error signal on the upper trace at 1V/cm/digit and the gate on the lower trace at 5V/cm. The sync signal on R815 which is used to sync the scope is in phase with the error signal and is not varied in time by the DELAY potentiometer R807. Therefore if a single trace scope is to be used, position the error signal over the center line of the graticule on the scope, move the probe to examine the gate signal on R817, and adjust the DELAY potentiometer on the Logic Driver Board #3 so that the leading edge of the gate appears 60 - 75us before the center line of the graticule. If the DELAY potentiometer reaches an extremity while attempting this adjustment change R808 from 22K to 15K.

The error signal must fall well within the gate. If it leads the gate the amplifier will overload and the voltmeter will respond only to distortion products which fall within the gate, and will appear to lack sensitivity. If the error signal lags the gating period the voltmeter will be dead. The choppers which are used in the Cimron 7000 series voltmeters (p/n 70-0505-1) are selected so that the delay potentiometer will be able to compensate for the time difference between the application of the drive pulse to the chopper coil and the contact closure.

The condition of the chopper can be examined by placing the voltmeter in "Standby" and introducing not more than three digits input signal and observing the trace for a period of one minute. The sides of the error signal should be smooth and there should be no indication of a double peak. The error signal should not have more than 10us of lateral movement.



Normal

Extra Peak Forming.

Two Peaks.

Note Loss of Amplitude.

## Adjustment of Gain Potentiometers on Cimron 7000 Series Voltmeters

The "SENS" and "UP BAL" potentiometers of Cimron 7000 series voltmeters (R939 & R854) are adjusted correctly if the voltmeter will change one digit in the units decade when the input level is changed 90 uv from a true null and a zero is present in the 10K window.

The "F-UP" potentiometer (R911) is adjusted correctly if an F-UP pulse is delivered when the input level is higher than the readout by 125 - 145mv.

A scope and a potentiometer capable of resolving 1mv to 1000 parts are required to adjust the above potentiometer. A ten-turn potentiometer of 100 to 1000 ohms with a counter dial is adequate to adjust the "SENS" and "UP-BAL" potentiometers. The "SENS" potentiometer must be adjusted first.

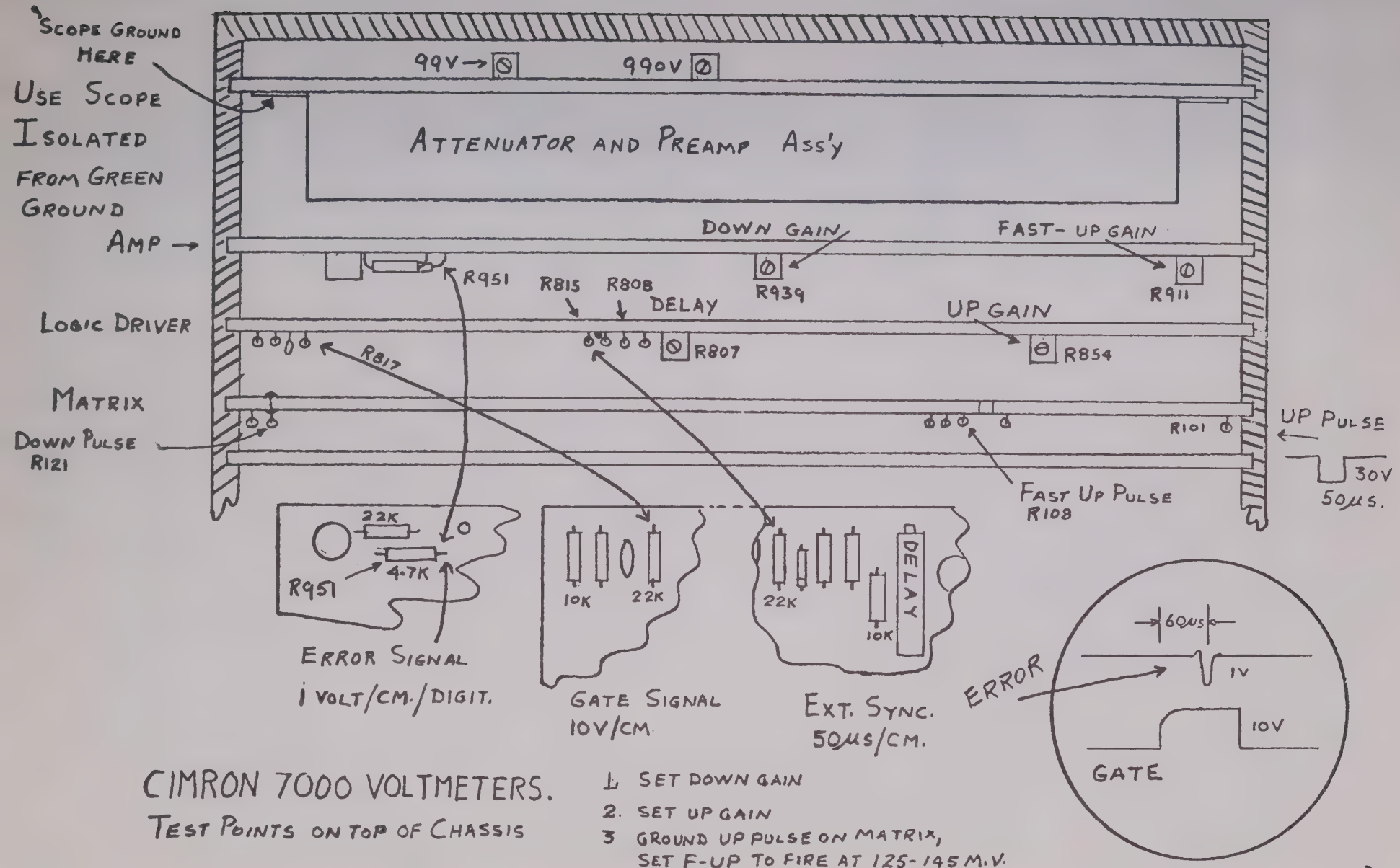
Connect the scope as indicated in the accompanying drawing. Apply -1mv across the ten-turn potentiometer. Then each turn of the potentiometer will be 100uv, or one digit. Turn the potentiometer until the voltmeter reads -0.0009, and adjust the potentiometer until there is no visible error in the scope. This is a true null. Now lower the input level to the voltmeter by 90uv (9/10 of a turn of the ten-turn potentiometer), and adjust the "SENS" potentiometer R939 until the voltmeter just steps down. The voltmeter will then show -0.0008 (or -0.0007 if the "UP BAL" gain is low). Adjustment of the "UP BAL" potentiometer is covered in the following paragraph. Adjust the ten-turn potentiometer until the voltmeter reads -0.0008 and obtain another true null. Now decrease the input level by 90uv until the voltmeter steps to -0.0007. Continue until -0.0000 is reached to insure the voltmeter will step down on each digit with a 90uv change.

To adjust the "UP-BAL" potentiometer R854, adjust the ten-turn potentiometer for a true null at -0.0000. Increase the input level to the voltmeter by 90uv, and adjust the "UP-BAL" potentiometer until the voltmeter steps to 0.0001. Adjust for a true null at -0.0001 and verify that the voltmeter will step to -0.0002. In a like manner, verify that the voltmeter will step with an input level change of 90uv throughout the decade.

Adjustment of the "SENS" and "UP-BAL" potentiometers must be done with care. Excess gain may cause instability in the units decade.

To adjust the "F-UP" potentiometer (R911), short the input leads to the voltmeter until -0.0000 is reached, and clamp the up pulse on R101 to DVM common. Move the scope probe to R108 to watch for a -25v pulse. Apply -130mv input to the voltmeter, and adjust the "F-UP" potentiometer R911 until a pulse just appears at R108. This is not a critical adjustment and in no way affects the calibration; however, instability in the first three digits may occur if the "F-UP" is set to fire below -120mv.

R. Manning
7-2-65



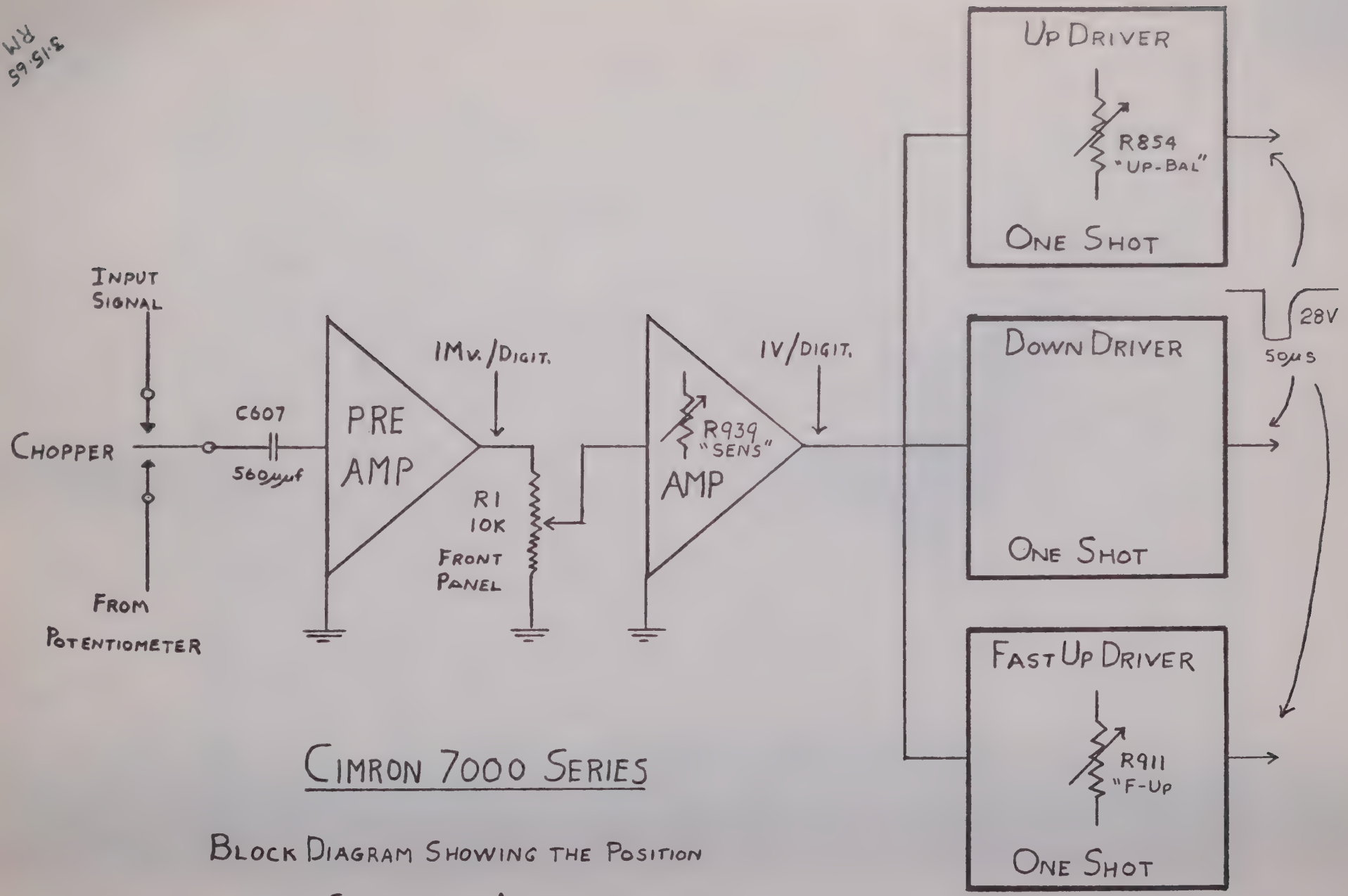

# CIMRON 7000 VOLTMETERS.

TEST POINTS ON TOP OF CHASSIS

1. SET DOWN GAIN
2. SET UP GAIN
3. GROUND UP PULSE ON MATRIX, SET F-UP TO FIRE AT 125-145 M.V.

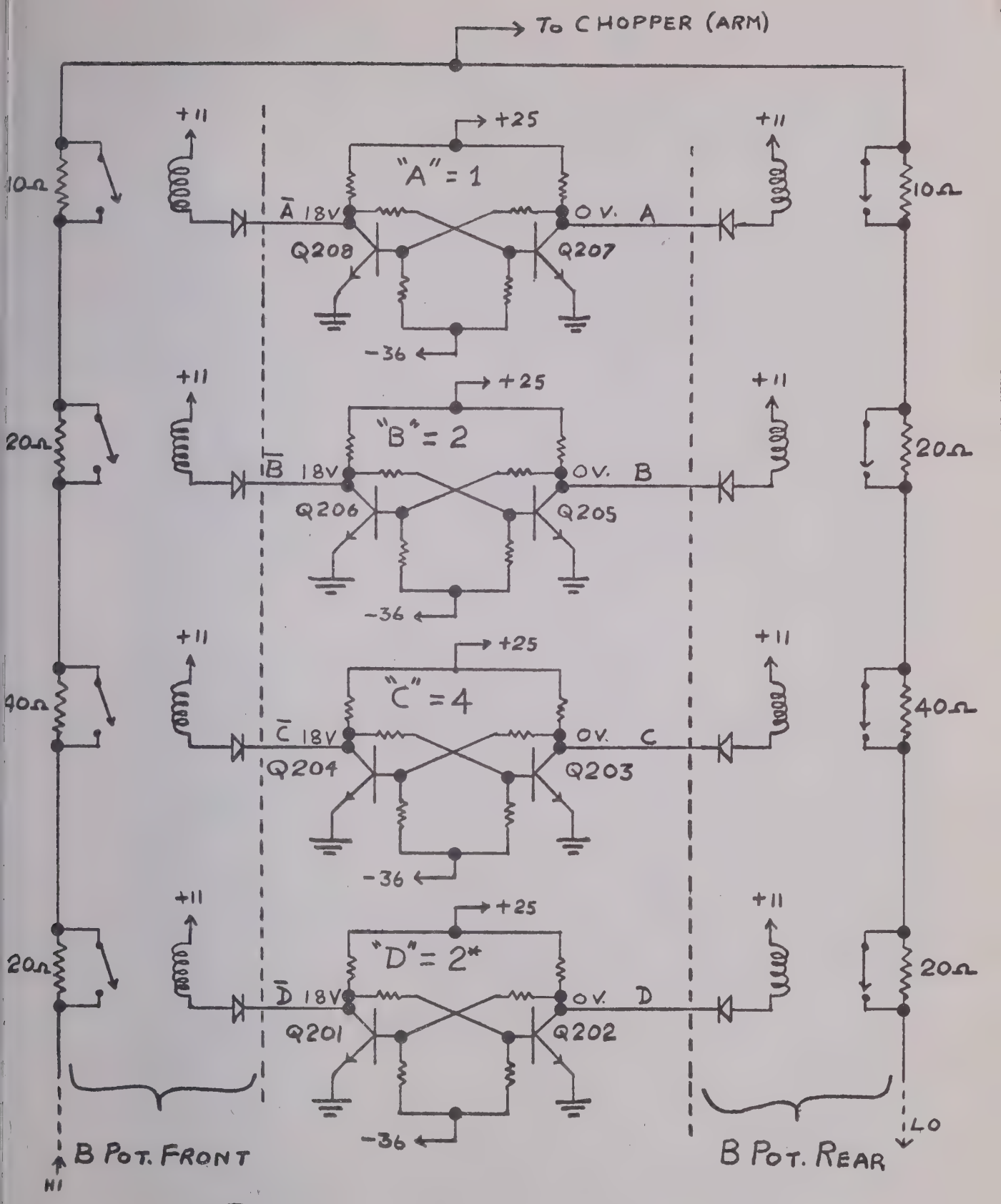
12.17.69
R.M.

3.15.65 RM




# CIMRON 7000 SERIES

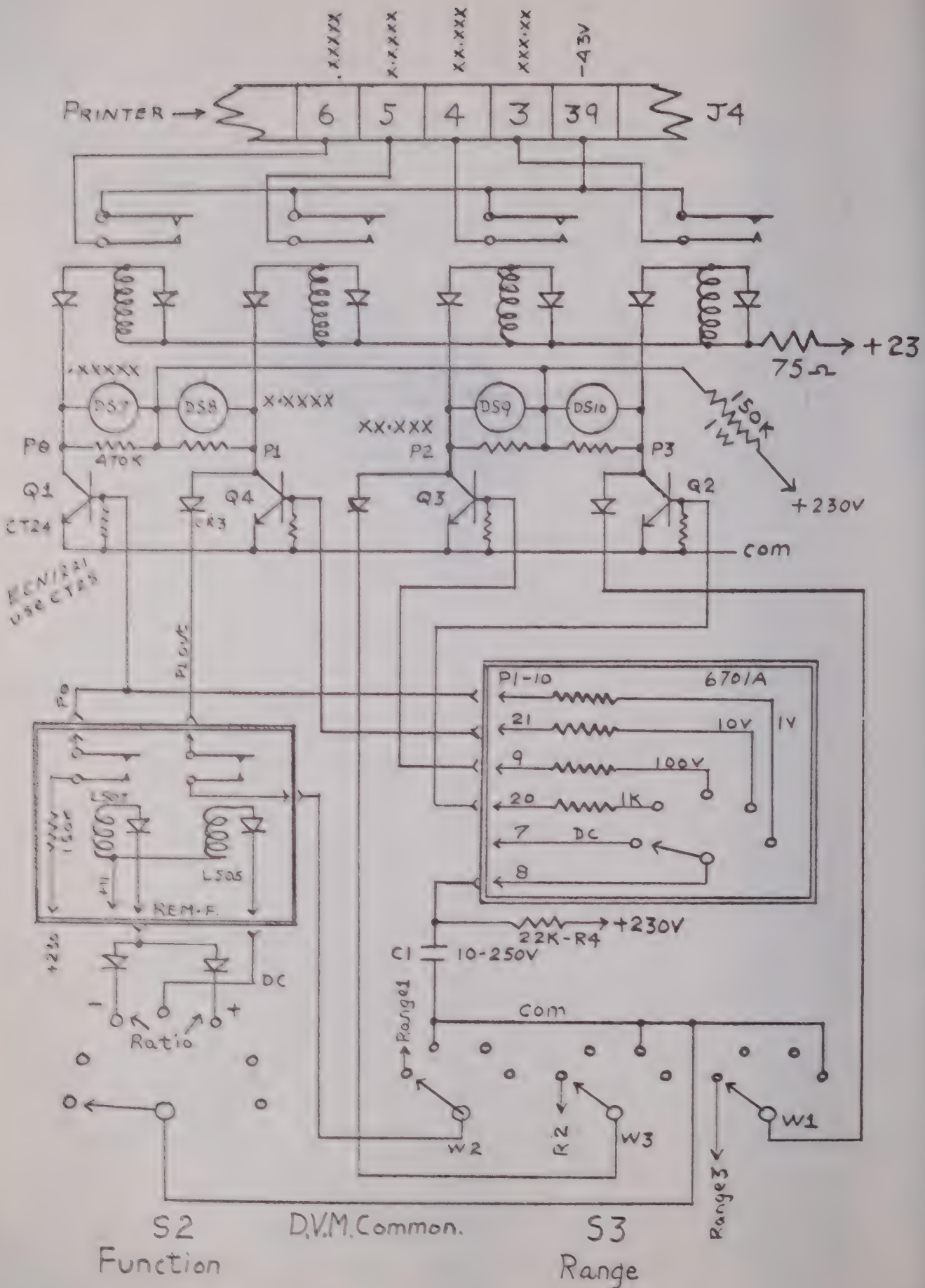
BLOCK DIAGRAM SHOWING THE POSITION OF SENSITIVITY ADJUSTMENTS.




# CIMRON 7000 SERIES

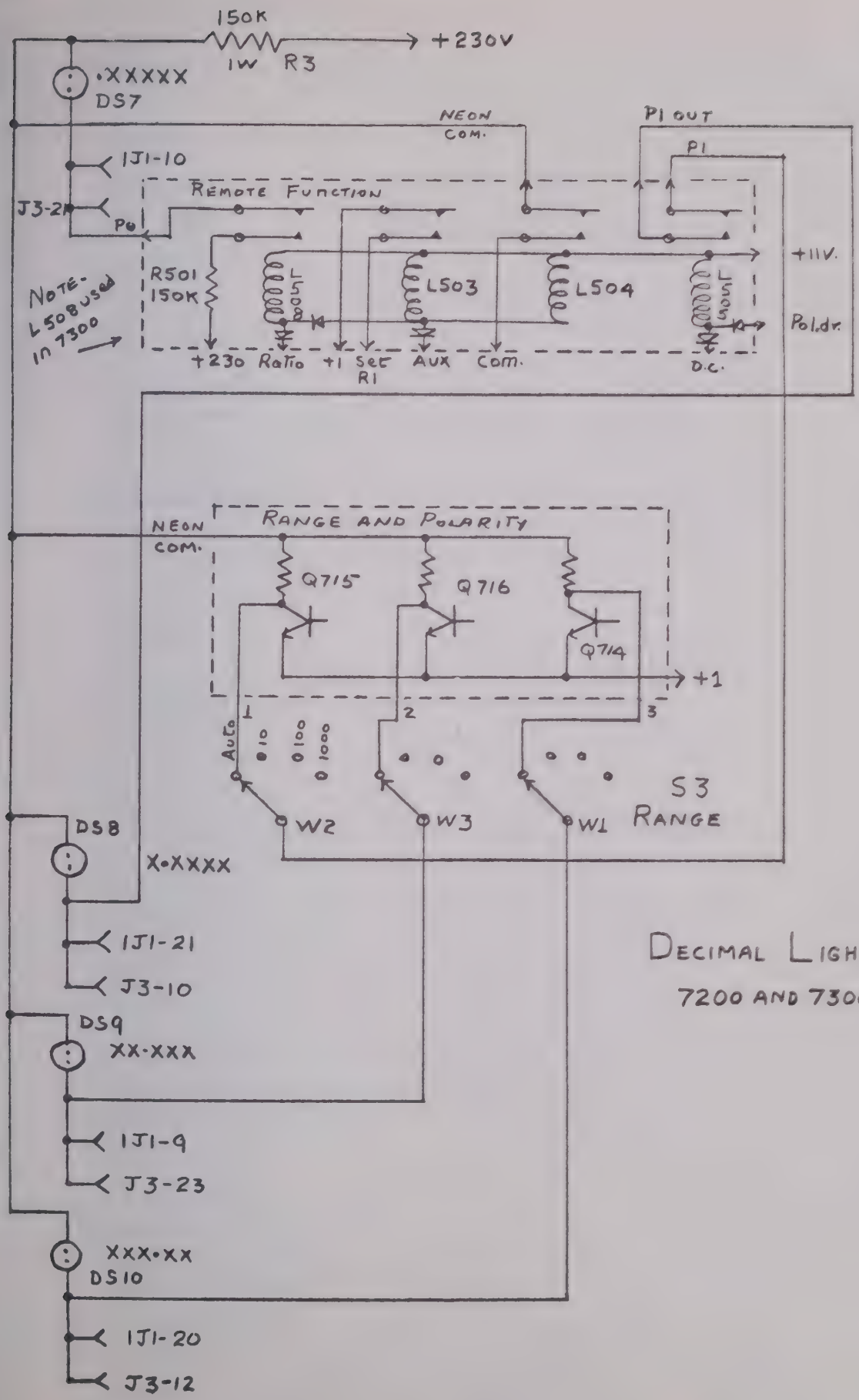
## UNITS DECADE BRIDGE AND FLIP-FLOPS

3.19.65
R.M.



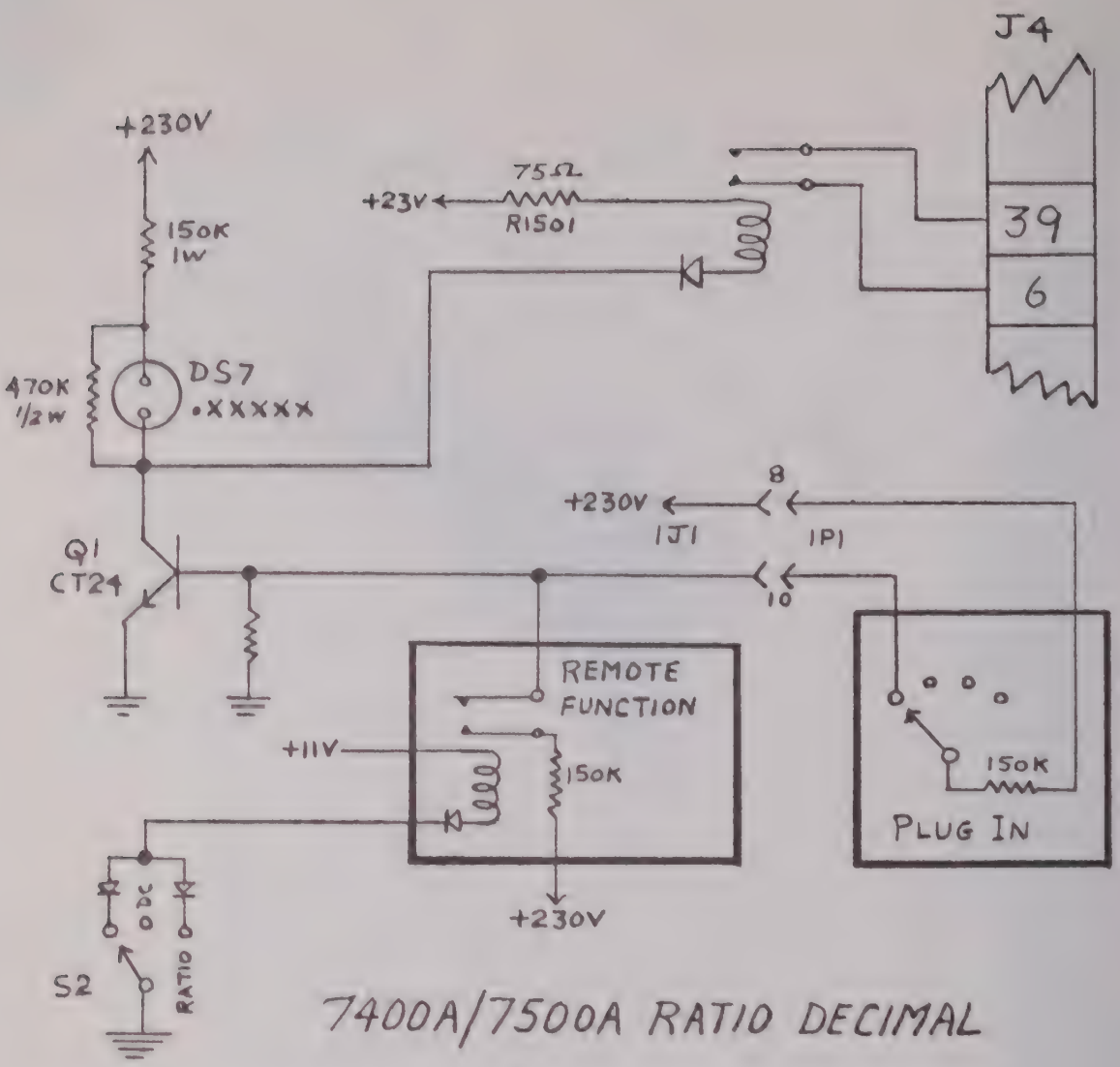

DECIMALS 7500

11.9.64
R.M.

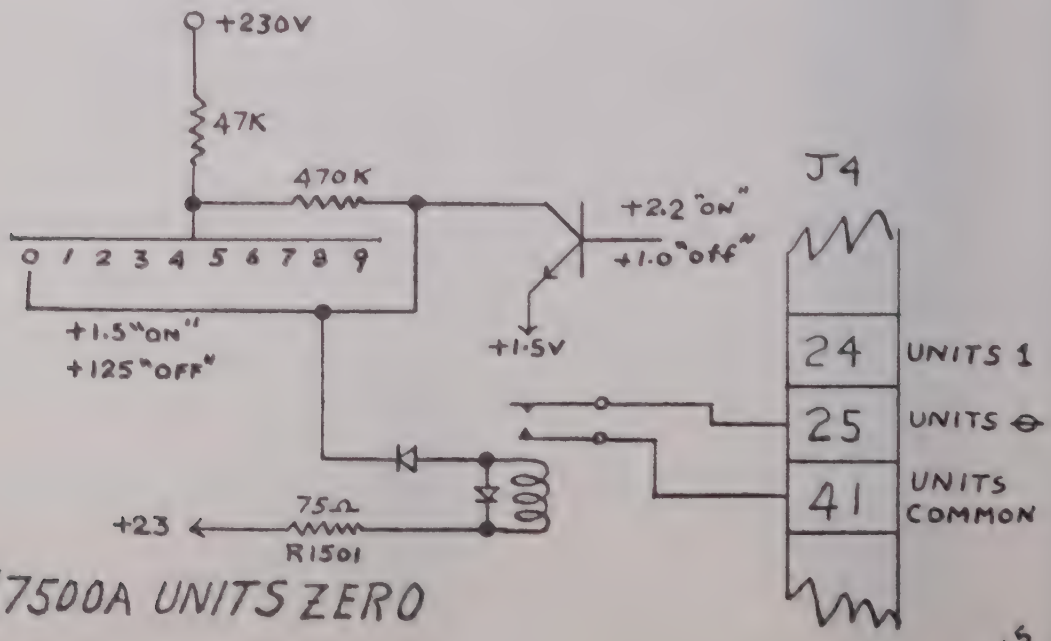



DECIMAL LIGHTS
7200 AND 7300

11-9-64
RM




7400A/7500A RATIO DECIMAL




7400A/7500A UNITS ZERO

3.15.65
RM

CIMRON DIVISION
LEAR SIEGLER, INC. / LSi
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January 11, 1965 | FIELD SERVICE BULLETIN | Issue 30

To: All customers having Series 7000A Instruments.

Instruments Affected: Digital Voltmeters of Series 7206A and 7406A, and Digital Volt-Ratio Meters of Series 7306A and 7506A

Reason for Issuance: Correction to parts list and schematic because of change in availability of reed relays K23, K24, K25, and K26 of Range and Polarity Assembly 70-6007.

Action Required: Note correction on parts list and schematic provided in Series 7000A Instruction Manual.

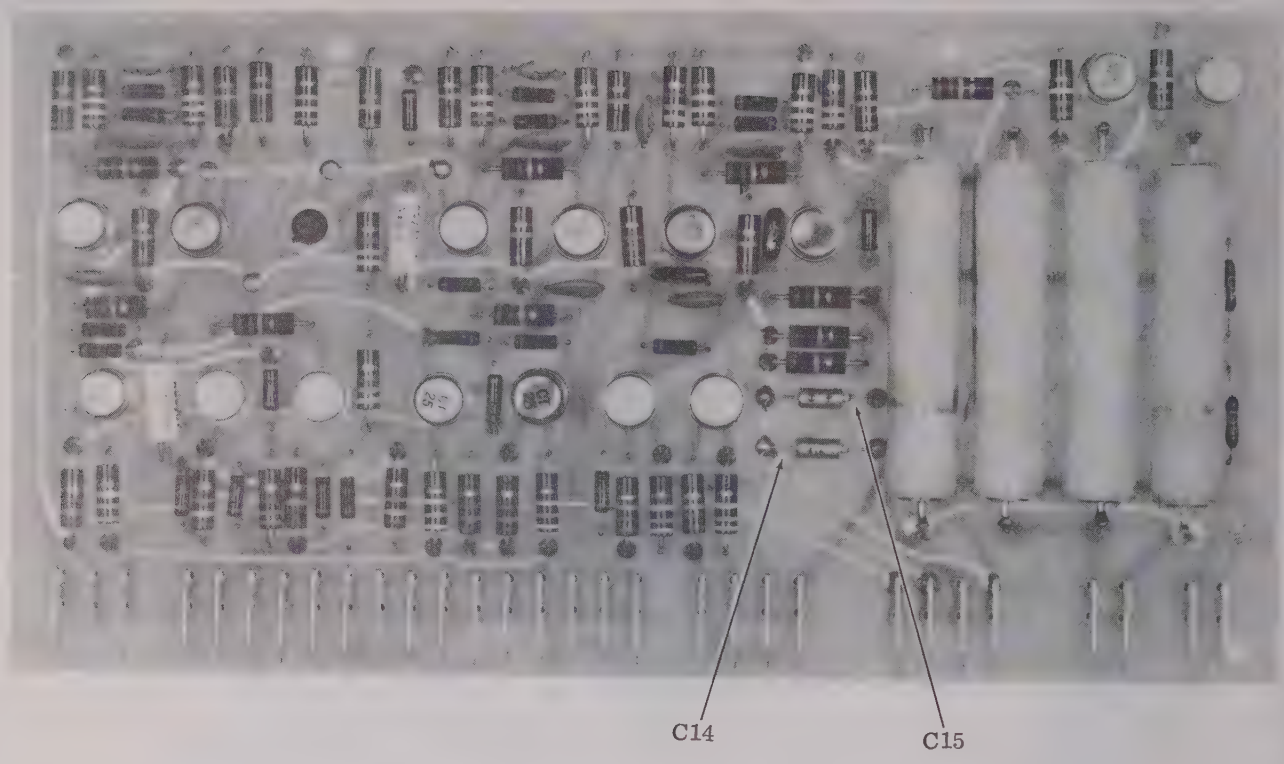
Reed relay Cimron part number 7-33200, used on Range and Polarity Assembly 70-6007, **is no longer available.**

Reed relay Cimron part number 7-33206, now used on the Range and Polarity Assembly 70-6007, will be used if polarity relays K23, K24, K25, and K26 require replacement.

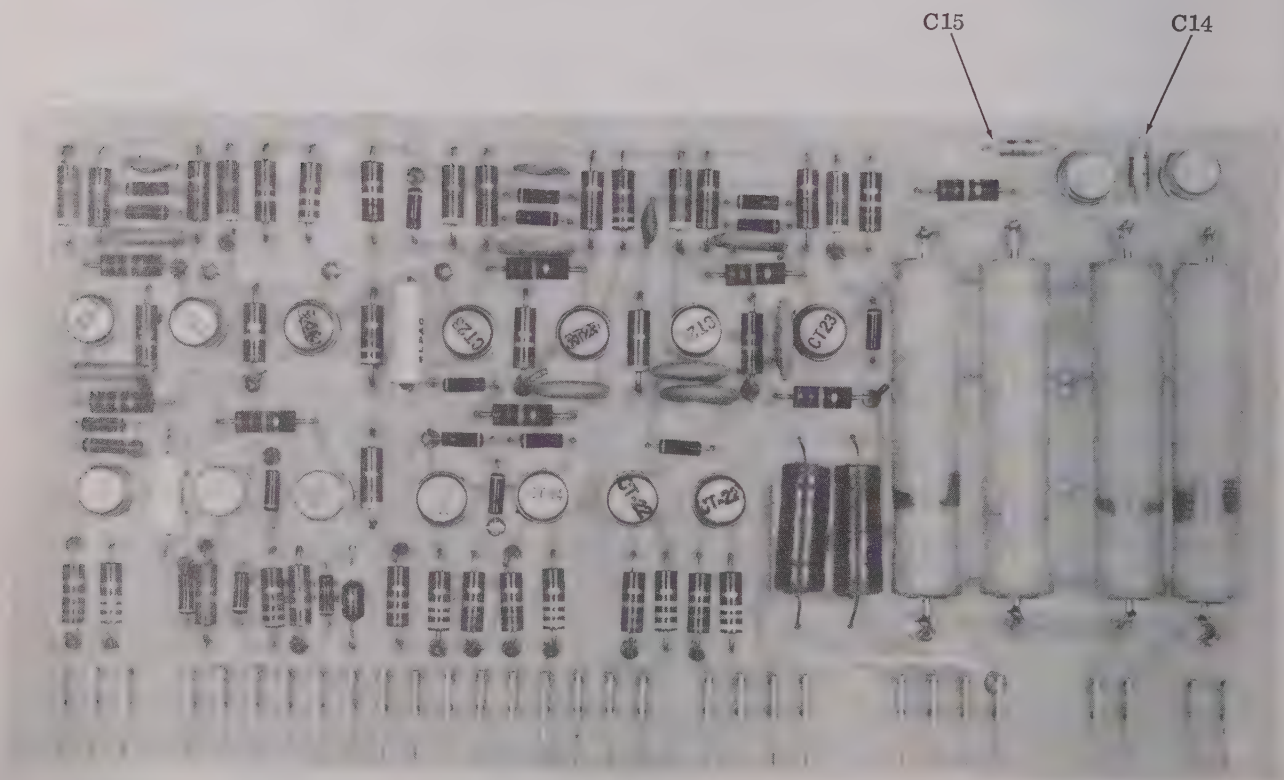
Reed relay Cimron part number 7-33206 is superior to the relay formerly used, with a different opening (drop out) time characteristic. To allow sufficient time between the opening of one set of relays and the closing of the other set of relays during a polarity change, capacitors are inserted in the polarity circuit to delay the turn-on signal rise time. Whenever the new reed relays are installed in the Range and Polarity Assembly, tantalum 0.47 uf, 10%, 35V capacitors, Cimron part number 1-37111, should be installed in the base circuits of transistors Q701 and Q702. These capacitors, shown as C714 and C715 on the attached schematic, must be installed with the negative end connected to COMMON.

Some models of the Series 7000A Instruments have 0.22 uf, 10%, 50V capacitors, Cimron part number 1-37216, installed as C714 and C715. These should be replaced with the 0.47 uf capacitors if the polarity relays are replaced with the new reed relays.

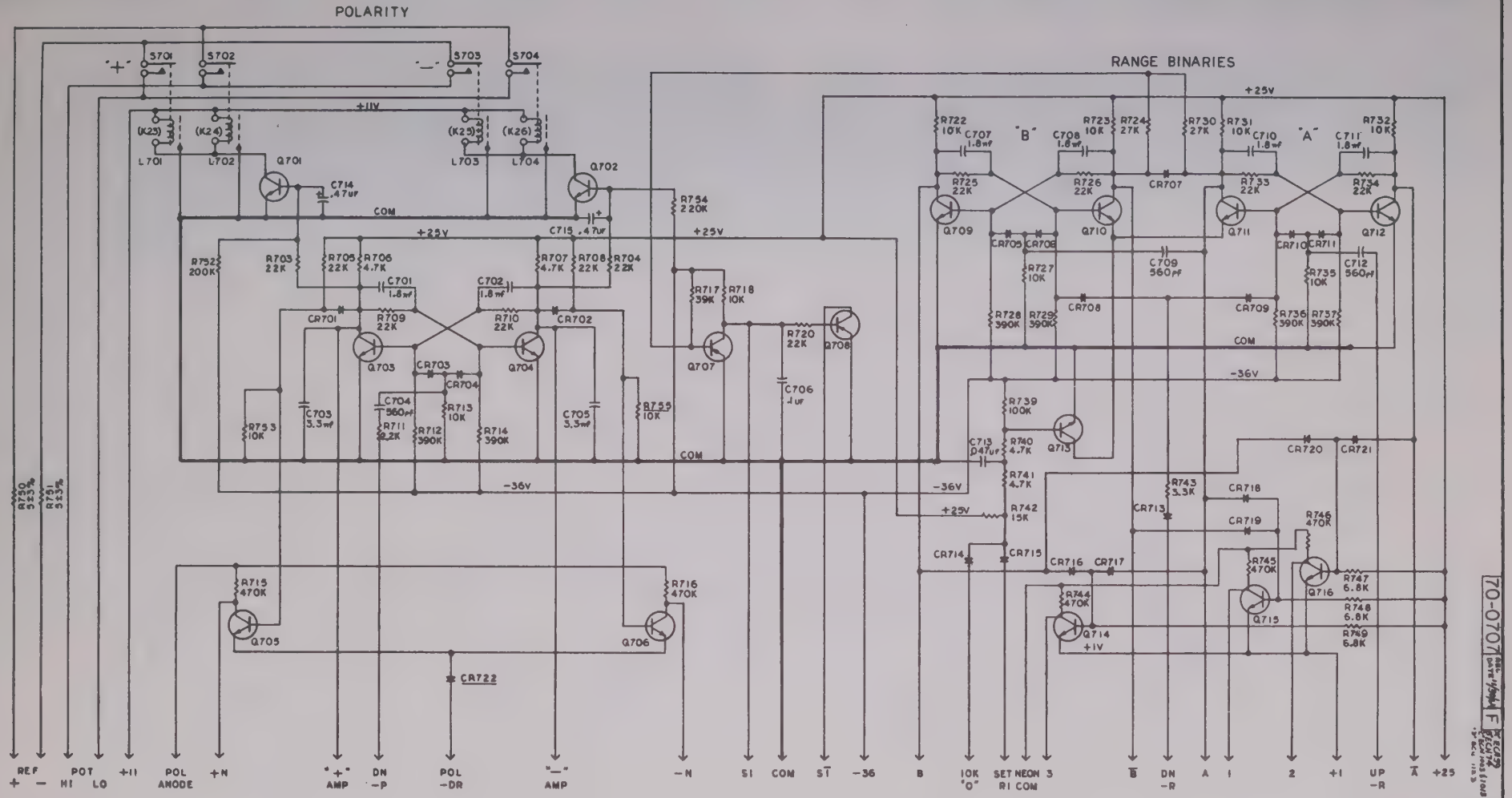
Donald Gregg
Customer Service Supervisor




Installation of 0.47uf capacitors C714 and C715 to replace 0.22uf capacitors now installed.




Installation of 0.47uf capacitors C714 and C715 on Range and Polarity Assembly which does not now have capacitors C714 and C715 installed.




NOTES ◇

1. PLUG-IN PIN CONNECTIONS NOT SHOWN IN SAME ORDER AS ON ASSEMBLY.
2. UNLESS OTHERWISE NOTED, RESISTORS ARE ½ WATT & ±5% TOLERANCE.

| | | | |
|---|---|---|---|
| DRAWING SIZE D | SCHEMATIC — 70-6007 RANGE & POLARITY ASSY. | CIMRON | |
| DESIGN | | 70-0707 | |
| CHECK | | | |
| DRAFT | | | |
| 7000 SERIES | PROJECT | | |
| MODEL | APPD DATE | APPD DATE | SCALE NONE SHEET 1 OF 1 |

CIMRON DIVISION
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MORENA BOULEVARD SAN DIEGO, CALIFORNIA 92110 A.C. 714 • 276-3200

May 13, 1965 | FIELD SERVICE BULLETIN | Issue 111

To: All Customers with Series 7000A Digital Voltmeter, 8000B Digital Voltmeter, or Model 6710A AC Converter.

Instrument Affected: All models of Series 7000A, Series 8000B, and 6710A AC Converter.

Reason for Issuance: Maintenance information and corrections to Manual Parts Lists.

Action Required: Note maintenance information, correct part numbers in Manual Parts Lists.

Reed relay MR-306-8 (Cimron part number 7-38216) is specified replacement for all reed relays MRG-1 (Cimron part number 7-38207) and MRR-1 (Cimron part number 7-38209).

LOGIC DRIVER ASSEMBLY 70-6008
Change part list to read:

| | | | | |
|---|---|---|---|---|
| S801 | RELAY SPST GOLD | 95348 | MR-306-8 | 7-38216 |

REMOTE FUNCTION ASSEMBLY 70-6005-2
Change part list to read:

| | | | | |
|---|---|---|---|---|
| S501 - S505 | RELAY SPST GOLD | 95348 | MR-306-8 | 7-38216 |

REMOTE FUNCTION ASSEMBLY 70-6005-1
Change part list to read:

| | | | | |
|---|---|---|---|---|
| S501 - S505, S507, S508 | RELAY SPST GOLD | 95348 | MR-306-8 | 7-38216 |

PRINT CONTROL ASSEMBLY 70-6014
Change part list to read:

| | | | | |
|---|---|---|---|---|
| S1401, S1402, S1405 | RELAY SPST GOLD | 95348 | MR-306-8 | 7-38216 |

PRINT OUTPUT SUB-ASSEMBLY 7500A, 7500A-162, 7400A
Change subassembly part list to read:

| | | | | |
|---|---|---|---|---|
| S1501 - S1563 | RELAY SPST GOLD | 95348 | MR-306-8 | 7-38216 |

ATTENUATOR ASSEMBLY 80-6005
Change part list to read:

| | | | | |
|---|---|---|---|---|
| S501, S502, S505, S506 | RELAY SPST GOLD | 95348 | MR-306-8 | 7-38216 |

RANGE AND POLARITY ASSEMBLY 80-6008
Change part list to read:

| | | | | |
|---|---|---|---|---|
| S802 - S805 | RELAY SPST GOLD | 95348 | MR-306-8 | 7-38216 |

PRINT CONTROL ASSEMBLY 80-6016
Change part list to read:

| | | | | |
|---|---|---|---|---|
| S1601 | RELAY SPST GOLD | 95348 | MR-306-8 | 7-38216 |

PRINT SUB-ASSEMBLY A 80-6017
Change part list to read:

| | | | | |
|---|---|---|---|---|
| S1701 - S1730 | RELAY SPST GOLD | 95348 | MR-306-8 | 7-38216 |

PRINT SUB-ASSEMBLY B 80-6018
Change part list to read:

| | | | | |
|---|---|---|---|---|
| S1801 - S1827 | RELAY SPST GOLD | 95348 | MR-306-8 | 7-38216 |

REFERENCE ASSEMBLY 80-6010
Change part list to read:

| | | | | |
|---|---|---|---|---|
| S1001 - S1004 | RELAY SPST GOLD | 95348 | MR-306-8 | 7-38216 |

AC CONVERTER ASSEMBLY 60-6720
Change part list to read:

| | | | | |
|---|---|---|---|---|
| S101 - S102 | RELAY SPST GOLD | 95348 | MR-306-8 | 7-38216 |

RANGE CONTROL ASSEMBLY 60-6722
Change part list to read:

| | | | | |
|---|---|---|---|---|
| S201 - S203 | RELAY SPST GOLD | 95348 | MR-306-8 | 7-38216 |

Donald L. Meyer
Customer Service Supervisor

CIMRON DIVISION
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May 13, 1965 FIELD SERVICE BULLETIN Issue 112

To: All Customers with Series 7000A Instruments.

Instruments Affected: Digital Voltmeters of Series 7200A and 7400A, and Digital Volt-Ratio Meters of Series 7300A and 7500A.

Reason for Issuance: Change in Reference Assembly

Action Required: Note for maintenance and part replacement information.

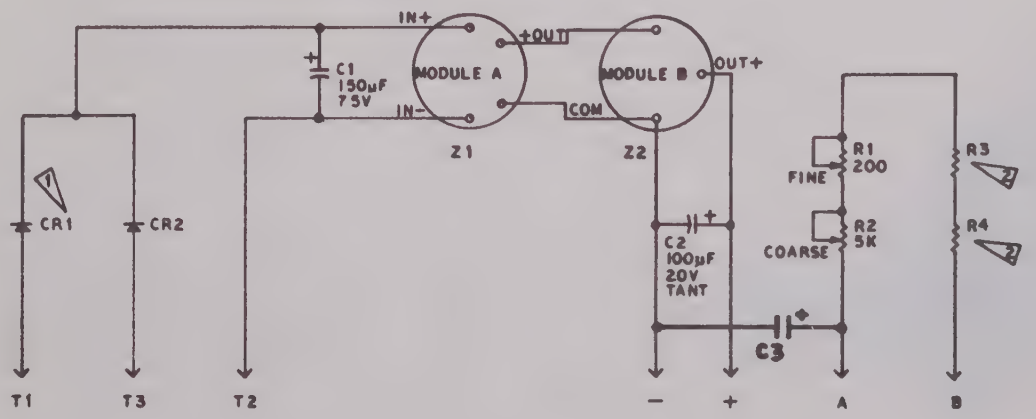
Cimron REFERENCE ASSEMBLY 70-6111 is a direct replacement for Cimron REFERENCE ASSEMBLY 70-6011-3. The replacement assembly is shown in schematic 70-0811. The input at T1 and T3 is rectified and filtered in diodes CR1, CR2, and capacitor C1. The input to the pre-regulator Module A is 45V DC ±10%. Module B contains the final reference element. The reference output voltage ranges are listed in Note 2 of the schematic. Module A and Module B are a matched pair, with the same serial number on each module.

PARTS LIST

ASSEMBLY: Reference CIMRON PART NO. 70-6111

| SCHEMATIC DESIGNATION | DESCRIPTION | CIMRON PART NO. |
|---|---|---|
| C1 | CAPACITOR, ELECT, 150 uf, 75V | 1-57271 |
| C2 | CAPACITOR, TANT, 100 uf, 20%, 20V | 1-57103 |
| R1 | RESISTOR, VAR TRIM WW, 200Ω, 1/4W | 7-54215 |
| R2 | RESISTOR, VAR TRIM WW, 5KΩ, 1/4W | 7-54207 |
| R3, R4 | FACTORY SELECTED VALUE | |
| CR1, CR2 | SEMICOND DIODE DI42S SC-2 | 7-95502 |
| | REFERENCE MOD A | 90-0509-1 |
| | REFERENCE MOD B | 90-0509-3 |

Donald R. Meyer
Customer Service Supervisor




70-0811
REL DATE 3-26-66

NOTES ◇

1. PARTIAL REFERENCE DESIGNATIONS SHOWN. ALL NUMBERS ARE IN THE SERIES 1101 & ON. EXAMPLE: CR1 IS CR1101, ETC.
2. RESISTANCE VALUES OF R1103 & R1104 ARE SELECTED RELATIVE TO THE OUTPUT VOLTAGE OF MODULE "B" — SEE TABLE.

| OUTPUT VOLTAGE OF Z1102 | RESISTOR VALUES | |
|---|---|---|
| | R1103 | R1104 |
| 11.90–12.10 | 10K | 7.5K |
| 12.10–12.40 | 10K | 10K |
| 12.40–12.60 | 20K | 2K |
| 12.60–12.90 | 20K | 5K |
| 12.90–13.23 | 20K | 7.5K |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| DRAWING SIZE C | SCHEMATIC — REFERENCE ASSY 70-6111 | | | | | | CIMRON | |
| | DESIGN | | | | | | 70-0811 | REV |
| | CHECK | | | CHF ENG | ROC | | | |
| 7000 SERIES | DRAFT | | | PROJECT | | | | |
| MODEL | | APPD | DATE | | APPD | DATE | SCALE NONE | SHEET 1 OF 1 |

CIMRON DIVISION
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October 29, 1965 | FIELD SERVICE BULLETIN | Issue 114

To: All Customers with Series 7000A Instruments.

Instruments Affected: Digital Voltmeter Models 7200A and 7400A, and Digital Volt-Ratio Meter Models 7300A and 7500A.

Reason for Issuance: To Improve Chopper Performance.

Action Required: Note Maintenance Information. Correct Part Numbers in Manual Parts List.

## GENERAL

The Engineering Department at Cimron is continuously striving to improve the performance of Cimron Products. Therefore the modifications listed in this Field Service Bulletin are not of a corrective nature but are suggested improvements.

Logic Driver Assembly 70-6008 has previously been installed in the Series 7000A Instruments. Cimron, however, has recently developed another Logic Driver Assembly designated as 70-6108. Recommended modifications for both assemblies are listed.

## LOGIC DRIVER ASSEMBLY 70-6008

Resistor R808 has been changed from 22KΩ to 15 KΩ to provide better control of gate pulse delay. If the chopper has an extremely long or short delay time, R808 may be selected to position the delay control potentiometer R807 within the proper adjustment range.

Capacitor C802 has been changed from 0.022uf to 0.033uf. This reduces the oscillator frequency to approximately 160 Hz for optimum chopper performance.

Resistor R826 has been changed from 470Ω to 47Ω to improve chopper performance. Due to the current increase, any ripple appearing on the 25V supply will be greater.

## LOGIC DRIVER ASSEMBLY 70-6108

Resistor R39 has been changed from 470Ω to 47Ω to improve chopper performance. Due to the current increase, any ripple appearing on the 25V supply will be greater.

Donald C. Meyer
Customer Service Supervisor

CIMRON DIVISION
LEAR SIEGLER, INC. LSi
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April 15, 1966 | FIELD SERVICE BULLETIN | Issue 116

To: All customers with Series 7000A and Series 7600 Instruments

Instruments Affected: All models of Series 7000A and Series 7600

Reason for Issuance: To improve chopper performance

Action Required: Incorporate the following modifications into the affected instruments and their associated instruction manuals.

LOGIC DRIVER ASSEMBLIES 70-6108 and 76-6012

1. Remove resistor R37, COMP, 6.8K, 1/2W, 5%, 7-41053
2. Change capacitor C14, ELECT, 10 uf, 50V, 1-57258 to capacitor C14, MET PAPER, 0.47 uf, 50V, 1-57318
3. Change resistor R35, COMP, 12K, 1/2W, 5%, 7-41056 to resistor R35, COMP, 6.8K, 1/2W, 5%, 7-41053.

Donald C. Meyer
Customer Service Supervisor

CIMRON DIVISION
LEAR SIEGLER, INC. / LSi
1152 MORENA BOULEVARD SAN DIEGO CALIFORNIA 92110 AC 714 • 276 2800

August 1, 1967 | FIELD SERVICE BULLETIN | 117

To: All customers with Series 7000A Instruments

Instruments Affected: Models 7200A and 7400A Digital Voltmeters and Models 7300A and 7500A Digital Volt-Ratiometers.

Reason for Issuance: Improved Reference Assembly availability

Action Required: Note for maintenance and part replacement information.

Cimron Reference Assembly 70-6140 is a direct replacement for Cimron Reference Assembly 70-6111 or 70-6111-3. The replacement assembly is shown in schematic diagram 70-0840, attached.

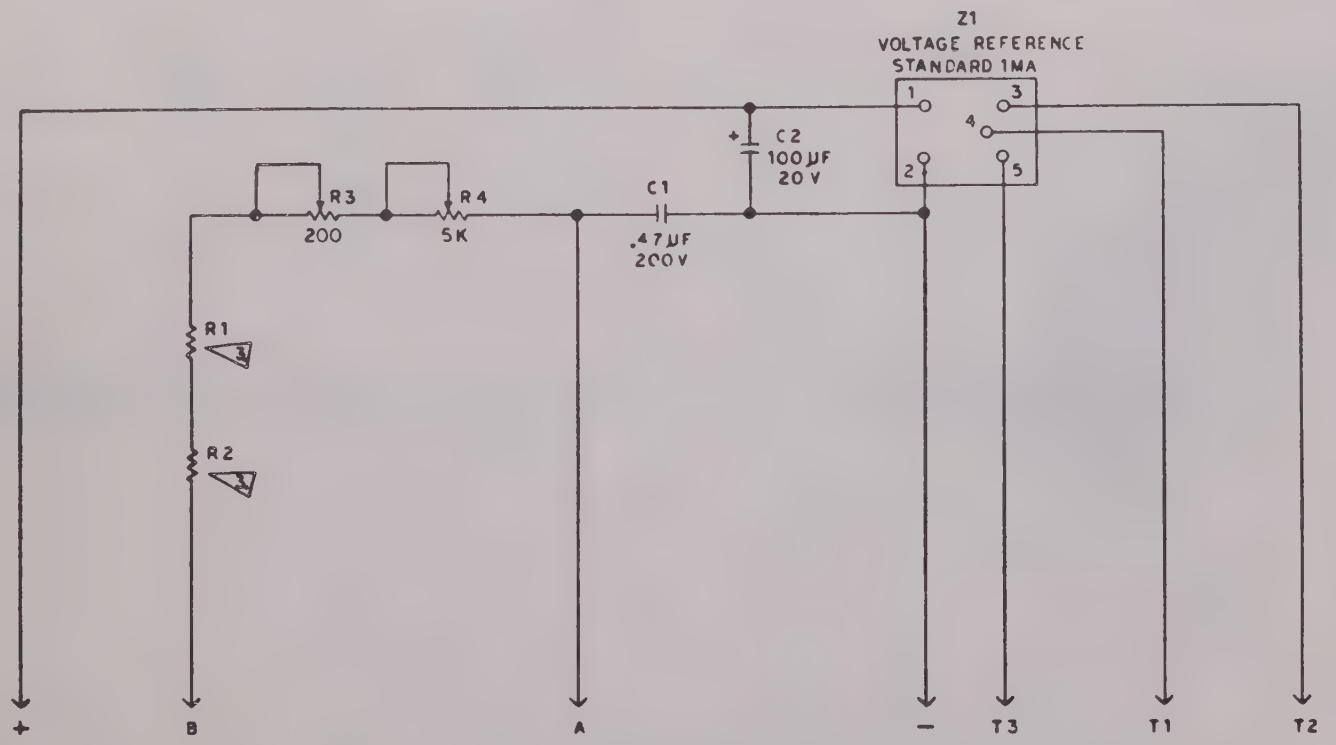
AC input power is received from the power transformer at terminals T1, T2, and T3. Reference module Z1 provides a stable 10-volt supply through terminals - and - to the Range and Polarity Assembly for polarity selection. The polarity-corrected reference voltage is received at terminal B. Potentiometers R3 and R4 are the calibration adjustment controls. The calibrated reference voltage is provided through terminal A to the Potentiometer Assemblies.

## PARTS LIST

CIMRON ASSEMBLY: Reference — CIMRON PART NO. 70-6140

| SCHEMATIC DESIGNATION | DESCRIPTION VALUE | TYPE | RATING | MANUFACTURER CODE | PART NO. | CIMRON PART NO. |
|---|---|---|---|---|---|---|
| **CAPACITOR** | | | | | | |
| C4001 | 0.47 µf | MET MYLAR | 200V | 12406 | ZD2A474 | 1-57307 |
| C4002 | 100 µf | TANT | 20V | 01295 | SCM107HP020D4 | 1-57103 |
| **RESISTOR** | | | | | | |
| R4001, R4002 | Factory Selected Value | | | | | |
| R4003 | 200Ω | VARIABLE WW | 1/4W | 97704 | 1PC-200Ω | 7-54239 |
| R4004 | 5 KΩ | VARIABLE WW | 1/4W | 97704 | 1PC-5K | 7-54241 |
| **MISCELLANEOUS** | | | | | | |
| Z1 | VOLTAGE REFERENCE STANDARD 1 MA | | | 15318 | | 76-0501-1 |
| | ETCHED CIRCUIT BOARD | | | 15318 | | 70-7140-1 |

Customer Service Supervisor




NOTES ◇

1. ALL RESISTORS ARE ±5%, 1/4 W.
2. PARTIAL REFERENCE DESIGNATIONS SHOWN. FOR COMPLETE DESIGNATOR ADD 4000 EXAMPLE R1 IS R4001.
3. ◁ FACTORY SELECTED VALUE.
4. LAST NO USED: C2, R4, Z1. | NO'S NOT USED: NONE

| | |
|---|---|
| MODEL | 7000 SERIES |
| CHF ENG | |
| PROJECT | |
| DESIGN | |
| CHECK | |
| DRAFT | CHARLES 4/4/66 |

| | |
|---|---|
| | 70-0840 |
| DEL DATE | |
| DRAWING SIZE | C |

SCHEMATIC —
REFERENCE
ASSY

ASSY 70-6140

CIMRON CORPORATION

70-0840

REPAIR PARTS KIT FOR 7600 SERIES DIGITAL VOLTMETERS

CIMRON PART NUMBER 5-40025

| Quantity | Item | Part Number |
|---|---|---|
| 1 | Logic Matrix Assembly | 76-6017 |
| 1 | Units Decade Assembly | 76-6018 |
| 1 | 10K Decade Assembly | 76-6011 |
| 1 | Logic Driver Assembly | 76-6012 |
| 1 | Range & Polarity Assembly | 76-6014 |
| 1 | Amplifier Assembly | 76-6013 |
| 1 | Attenuator/Preamplifier Assembly | 76-6016 |
| 1 | "B" Potentiometer Assembly | 76-6020 |
| 1 | "A" Potentiometer Assembly | 76-6019 |
| 1 | Power Supply #1 | 76-6021 |
| 1 | Power Supply #2 | 76-6022 |
| 1 | Reference & Ratio Assembly | 76-6024 |
| 1 | Print Control Assembly | 76-6023 |
| 1 | Print Output A | 76-6008 |
| 1 | Print Output B | 76-6009 |
| 1 | Print Output C | 76-6010 |
| 1 | Print Output D | 76-6007 |
| 1 | Extension Board Assembly (Long) | 76-9502-1 |
| 1 | Extension Board Assembly (Short) | 76-9503-1 |
| 1 | Logic Tester Assembly | 76-9504-1 |
| 1 | Input Cable Assembly | 90-5004-3 |
| 1 | Tool, Extraction | 70-9500-1 |
| 5 | Thermal Switch | 70-0509 |
| 1 | Chopper | 70-0505-1 |
| 1 | Coil Reed Switch Actuator | 70-0501-1 |
| 2 | Capacitor 400 MFD 50V | 1-57259 |
| 1 | Capacitor 40 MFD 250V | 1-57268 |
| 1 | Capacitor 500 MFD 3V | 1-57239 |
| 1 | Capacitor 750 MFD 30V | 1-57254 |
| 1 | Numeral Indicator | 3-41407 |
| 1 | Polarity Indicator | 3-41406 |
| 5 | Fuse 1/2 ASB | 4-08013 |
| 8 | Diode SC-2 | 7-95502 |
| 4 | Diode SC-6 | 7-95504 |
| 8 | Diode CD-62 | 7-95507 |
| 18 | Diode CD-61 | 7-95511 |
| 1 | Reed Switch | 7-38211 |
| 2 | Reed Switch | 7-38208 |
| 7 | Reed Switch | 7-38216 |



Effective November 1, 1966

| Quantity | Item | Part Number |
|---|---|---|
| 2 | 18V Printact | 7-38214 |
| 3 | Coil-Reed Drive | 70-0511-1 |
| 2 | Transistor 2N697 | 9-04716 |
| 2 | Transistor 2N3440 | 9-04801 |
| 14 | Transistor 2N3567 | 9-04719 |
| 2 | Transistor 2N2647 | 9-04400 |
| 2 | Transistor 2N3565 | 9-04725 |
| 2 | Transistor 2N1304 | 9-04500 |
| 2 | Transistor CT-20 | 9-04701 |
| 4 | Transistor CT-22 | 9-04705 |
| 2 | Transistor CT-26 | 9-04710 |
| 1 | Transistor 2N1183B | 9-04605 |
| 4 | Transistor 2N1309 | 9-04611 |
| 1 | Transistor 2N404A | 9-04609 |
| 1 | 7600 Series Instruction Manual | |
| 1 | Spare Parts Kit Case | |

THIS KIT IS PRICED AT $3,470.00



Effective November 1, 1966

PRICE LIST FOR INDIVIDUAL ASSEMBLIES AND SPARE PARTS

CIMRON 7600 SERIES DIGITAL VOLTMETERS

| ITEM | QUANTITY PER DVM | PART NUMBER | UNIT PRICE |
|---|---|---|---|
| Logic Matrix Assembly | 1 | 76-6017 | $ 83.00 |
| Units Decade Assembly | 1 | 76-6018 | 141.00 |
| 10K Decade Assembly | 1 | 76-6011 | 145.00 |
| Logic Driver Assembly | 1 | 76-6012 | 144.00 |
| Range & Polarity Assembly | 1 | 76-6014 | 137.00 |
| Amplifier Assembly | 1 | 76-6013 | 148.00 |
| Attenuator/Preamplifier Assembly | 1 | 76-6016 | 340.00 |
| "B" Potentiometer Assembly | 1 | 76-6020 | 231.00 |
| "A" Potentiometer Assembly | 1 | 76-6019 | 477.00 |
| Power Supply #1 | 1 | 76-6021 | 74.00 |
| Power Supply #2 | 1 | 76-6022 | 65.00 |
| Power Supply #3 | 1 | 76-6004 | 50.00 |
| Reference & Ratio Assembly | 1 | 76-6024 | 174.00 |
| Print Control Assembly | 1 | 76-6023 | 74.00 |
| Print Output A | 1 | 76-6008 | 150.00 |
| Print Output B | 1 | 76-6009 | 165.00 |
| Print Output C | 1 | 76-6010 | 93.00 |
| Print Output D | 1 | 76-6007 | 140.00 |
| Extension Board Assembly (Long) | 1 | 76-9502-1 | 92.00 |
| Extension Board Assembly (Short) | 1 | 76-9503-1 | 87.00 |
| Extender Board Assembly (Accessory) | 1 | 76-9501-1 | 74.00 |
| Logic Tester Assembly | 1 | 76-9504-1 | 130.00 |
| Input Cable Assembly | 1 | 90-5004-3 | 66.00 |
| Tool, Extraction | 1 | 70-9500-1 | 3.75 |
| Thermal Switch | 5 | 70-0509 | 11.83 |
| Chopper | 1 | 70-0505-1 | 100.00 |
| Coil Reed Switch Actuator | 1 | 70-0501-1 | 3.63 |
| Capacitor 400 MFD 50V | 2 | 1-57293 | 1.68 |
| Capacitor 40 MFD 250V | 1 | 1-57268 | 1.65 |
| Capacitor 500 MFD 3V | 1 | 1-57239 | 1.23 |
| Capacitor 750 MFD 30V | 1 | 1-57292 | 1.85 |
| Numeral Indicator | 1 | 3-41407 | 19.90 |
| Polarity Indicator | 1 | 3-41406 | 19.90 |
| Fuse 1/2 ASB | 5 | 4-08013 | .45 |
| Diode SC-2 | 8 | 7-95502 | .90 |
| Diode SC-6 | 4 | 7-95504 | 1.08 |
| Diode CD-62 | 8 | 7-95507 | .40 |



Effective July 15, 1967

PRICE LIST FOR INDIVIDUAL ASSEMBLIES AND SPARE PARTS
CIMRON 7600 SERIES DIGITAL VOLTMETERS (Cont'd)

| ITEM | QUANTITY PER DVM | PART NUMBER | UNIT PRICE |
|---|---|---|---|
| Diode CD-61 | 18 | 7-95511 | $ .33 |
| Reed Switch | 1 | 7-38211 | 3.88 |
| Reed Switch | 2 | 7-38208 | 1.50 |
| Reed Switch | 7 | 7-38216 | 1.28 |
| 18V Printact | 2 | 7-38214 | 4.93 |
| Coil-Reed Drive | 3 | 70-0511-1 | 2.55 |
| Transistor 2N697 | 2 | 9-04716 | 2.13 |
| Transistor 2N3440 | 2 | 9-04801 | 2.83 |
| Transistor 2N3567 | 14 | 9-04719 | .58 |
| Transistor 2N2647 | 2 | 9-04400 | 1.88 |
| Transistor 2N3565 | 2 | 9-04725 | .70 |
| Transistor 2N1304 | 2 | 9-04500 | .93 |
| Transistor CT-20 | 2 | 9-04701 | 1.25 |
| Transistor CT-22 | 4 | 9-04705 | 2.50 |
| Transistor CT-26 | 2 | 9-04710 | 1.75 |
| Transistor 2N1183B | 1 | 9-04605 | 5.00 |
| Transistor 2N404A | 1 | 9-04609 | .88 |



Effective July 15, 1967

# CIMRON 7600 SERIES DIGITAL VOLTMETERS

## DESCRIPTION OF LOGIC

The logic of the 7600 Series instrument is identical in principle with the 7000 Series instruments.

CIMRON DIVISION
LEAR SIEGLER, INC. / LSi
2 MORENA BOULEVARD SAN DIEGO, CALIFORNIA 92110 A.C. 714 • 276-3200

April 15, 1966 | FIELD SERVICE BULLETIN | Issue 116

To: All customers with Series 7000A and Series 7600 Instruments

Instruments Affected: All models of Series 7000A and Series 7600

Reason for Issuance: To improve chopper performance

Action Required: Incorporate the following modifications into the affected instruments and their associated instruction manuals.

LOGIC DRIVER ASSEMBLIES 70-6108 and 76-6012

1. Remove resistor R37, COMP, 6.8K, 1/2W, 5%, 7-41053
2. Change capacitor C14, ELECT, 10 uf, 50V, 1-57258 to capacitor C14, MET PAPER, 0.47 uf, 50V, 1-57318
3. Change resistor R35, COMP, 12K, 1/2W, 5%, 7-41056 to resistor R35, COMP, 6.8K, 1/2W, 5%, 7-41053.

Donald C. Meyer
Customer Service Supervisor

REPAIR PARTS KIT FOR 8000 SERIES DIGITAL VOLTMETERS

CIMRON PART NUMBER 5-40026

| Quantity | Item | Part Number |
|---|---|---|
| 1 | Standard Decade Assembly | 80-6001 |
| 1 | Hi Decade Assembly | 80-6002 |
| 1 | 10K Potentiometer Assembly | 80-6003 |
| 1 | Lo Potentiometer Assembly | 80-6004 |
| 1 | Attenuator Assembly | 80-6005 |
| 1 | Amplifier Assembly | 80-6006 |
| 1 | Driver Assembly | 80-6007 |
| 1 | Range & Polarity Assembly | 80-6108 |
| 1 | Power Supply Assembly | 80-6009 |
| 1 | Reference Assembly | 80-6110 |
| 1 | Function Assembly | 80-6012 |
| 1 | 2K Potentiometer Assembly | 80-6014 |
| 1 | 400 Ohms Potentiometer Assembly | 80-6015 |
| 1 | Extension Board Assembly | 80-9501-1 |
| 1 | Logic Tester Assembly | 80-9502-1 |
| 1 | Input Cable Assembly | 80-5007-1 |
| 1 | Resistor, Term Disc, 10K @ 25°C | 7-48501 |
| 12 | Relay Reed SPST Gold, MRG-1 | 7-38207 |
| 6 | Relay Reed, MR-306-8 | 7-38216 |
| 5 | Relay Reed, DRR-5 | 7-38211 |
| 1 | Capacitor, Elect, 25 MF, 25V, 85° | 1-57223 |
| 2 | Coil Reed Switch Actuator | 80-0502-1 |
| 2 | Chopper SPDT BBM | 70-0505-1 |
| 2 | Lamp Glow, NE-2H | 5-46501 |
| 4 | Transistor, CT-26 | 9-04710 |
| 2 | Transistor, CT-23 | 9-04706 |
| 1 | Transistor, CT-22 | 9-04705 |
| 1 | Transistor, CT-31 | 9-04800 |
| 1 | Transistor, CT-20 | 9-04701 |
| 2 | Transistor, CT-25 | 9-04709 |
| 1 | Semicond, Diode, DI42S or SC2 | 7-95502 |
| 1 | Semicond, Diode, DI46S or SC6 | 7-95504 |
| 2 | Semicond, Diode, CD-63 | 7-95503 |
| 2 | Semicond, Diode, CD-62 | 7-95507 |
| 3 | Semicond, Diode, CD-61 | 7-95511 |
| 5 | Fuse, 3AF, S-B, 1/2 A | 4-08013 |
| 1 | Fuse, 3AG, F-B, 1 A | 4-07018 |
| 1 | 8000 Series Instruction Manual | |
| 1 | Spare Parts Kit Case | |

THIS KIT IS PRICED AT $2,745.82.

Effective November 1, 1966

PRICE LIST FOR INDIVIDUAL ASSEMBLIES AND SPARE PARTS

CIMRON 8000B SERIES DIGITAL VOLTMETERS

| ITEM | QUANTITY PER DVM | PART NUMBER | UNIT PRICE |
|---|---|---|---|
| Standard Decade Assembly | 1 | 80-6001 | $158.00 |
| Hi Decade Assembly | 1 | 80-6002 | 177.00 |
| 10K Potentiometer Assembly | 1 | 80-6003 | 238.00 |
| Lo Potentiometer Assembly | 1 | 80-6004 | 161.00 |
| Attenuator Assembly | 1 | 80-6005 | 323.00 |
| Amplifier Assembly | 1 | 80-6006 | 142.00 |
| Driver Assembly | 1 | 80-6007 | 142.00 |
| Range & Polarity Assembly | 1 | 80-6108 | 173.00 |
| Power Supply Assembly | 1 | 80-6009 | 82.00 |
| Reference Assembly | 1 | 80-6110 | 195.00 |
| Function Assembly | 1 | 80-6012 | 38.00 |
| Ratio Function Assembly | 1 | 80-6111 | 96.00 |
| 2K Potentiometer Assembly | 1 | 80-6014 | 211.00 |
| 400 Ohms Potentiometer Assembly | 1 | 80-6015 | 192.00 |
| Print Control Assembly | 1 | 80-6016 | 177.00 |
| Extension Board Assembly | 1 | 80-9501-1 | 37.00 |
| Logic Tester Assembly | 1 | 80-9502-1 | 75.00 |
| Input Cable Assembly | 1 | 80-5007-1 | 18.00 |
| Resistor, Therm Disc, 10K @ 25°C | 1 | 7-48501 | 1.28 |
| Relay Reed SPST Gold, MRG-1 | 12 | 7-38207 | 1.68 |
| Relay Reed, MR-306-8 | 6 | 7-38216 | 1.28 |
| Relay Reed, DRR-5 | 5 | 7-38211 | 3.88 |
| Capacitor, Elect, 25 MF, 25V, 85° | 1 | 1-57223 | 0.83 |
| Coil Reed Switch Actuator | 2 | 80-0502-1 | 2.85 |
| Chopper SPDT BBM | 2 | 70-0505-1 | 100.00 |
| Lamp Glow, NE-2H | 2 | 5-46501 | 0.20 |
| Transistor, CT-26 | 4 | 9-04710 | 1.75 |
| Transistor, CT-23 | 2 | 9-04706 | 1.38 |
| Transistor, CT-22 | 1 | 9-04705 | 2.50 |
| Transistor, CT-31 | 1 | 9-04800 | 3.75 |
| Transistor, CT-20 | 1 | 9-04701 | 1.25 |
| Transistor, CT-25 | 2 | 9-04709 | 2.00 |
| Semicond, Diode, DI42S or SC2 | 1 | 7-95502 | 0.90 |
| Semicond, Diode, DI46S or SC6 | 1 | 7-95504 | 1.08 |
| Semicond, Diode, CD-63 | 2 | 7-95503 | 0.50 |
| Semicond, Diode, CD-62 | 2 | 7-95507 | 0.40 |
| Semicond, Diode, CD-61 | 3 | 7-95511 | 0.33 |
| Fuse, 3AF, S-B, 1/2 A | 5 | 4-08013 | 0.45 |
| Fuse, 3AG, F-B, 1A | 1 | 4-07018 | 0.15 |

Effective July 15, 1967

CIMRON DIVISION
LEAR SIEGLER, INC. / LSi
52 MORENA BOULEVARD SAN DIEGO, CALIFORNIA 92110 A.C. 714 • 276-3200

May 13, 1965 | FIELD SERVICE BULLETIN | Issue 111

To: All Customers with Series 7000A Digital Voltmeter, 8000B Digital Voltmeter, or Model 6710A AC Converter.

Instrument Affected: All models of Series 7000A, Series 8000B, and 6710A AC Converter.

Reason for Issuance: Maintenance information and corrections to Manual Parts Lists.

Action Required: Note maintenance information, correct part numbers in Manual Parts Lists.

Reed relay MR-306-8 (Cimron part number 7-38216) is specified replacement for all reed relays MRG-1 (Cimron part number 7-38207) and MRR-1 (Cimron part number 7-38209).

LOGIC DRIVER ASSEMBLY 70-6008
Change part list to read:

| | | | | |
|---|---|---|---|---|
| S801 | RELAY SPST GOLD | 95348 | MR-306-8 | 7-38216 |

REMOTE FUNCTION ASSEMBLY 70-6005-2
Change part list to read:

| | | | | |
|---|---|---|---|---|
| S501 - S505 | RELAY SPST GOLD | 95348 | MR-306-8 | 7-38216 |

REMOTE FUNCTION ASSEMBLY 70-6005-1
Change part list to read:

| | | | | |
|---|---|---|---|---|
| S501 - S505, S507, S508 | RELAY SPST GOLD | 95348 | MR-306-8 | 7-38216 |

PRINT CONTROL ASSEMBLY 70-6014
Change part list to read:

| | | | | |
|---|---|---|---|---|
| S1401, S1402, S1405 | RELAY SPST GOLD | 95348 | MR-306-8 | 7-38216 |

PRINT OUTPUT SUB-ASSEMBLY 7500A, 7500A-162, 7400A
Change subassembly part list to read:

| | | | | |
|---|---|---|---|---|
| S1501 - S1563 | RELAY SPST GOLD | 95348 | MR-306-8 | 7-38216 |

ATTENUATOR ASSEMBLY 80-6005
Change part list to read:

| | | | | |
|---|---|---|---|---|
| S501, S502, S505, S506 | RELAY SPST GOLD | 95348 | MR-306-8 | 7-38216 |

RANGE AND POLARITY ASSEMBLY 80-6008
Change part list to read:

| | | | | |
|---|---|---|---|---|
| S802 - S805 | RELAY SPST GOLD | 95348 | MR-306-8 | 7-38216 |

PRINT CONTROL ASSEMBLY 80-6016
Change part list to read:

| | | | | |
|---|---|---|---|---|
| S1601 | RELAY SPST GOLD | 95348 | MR-306-8 | 7-38216 |

PRINT SUB-ASSEMBLY A 80-6017
Change part list to read:

| | | | | |
|---|---|---|---|---|
| S1701 - S1730 | RELAY SPST GOLD | 95348 | MR-306-8 | 7-38216 |

PRINT SUB-ASSEMBLY B 80-6018
Change part list to read:

| | | | | |
|---|---|---|---|---|
| S1801 - S1827 | RELAY SPST GOLD | 95348 | MR-306-8 | 7-38216 |

REFERENCE ASSEMBLY 80-6010
Change part list to read:

| | | | | |
|---|---|---|---|---|
| S1001 - S1004 | RELAY SPST GOLD | 95348 | MR-306-8 | 7-38216 |

AC CONVERTER ASSEMBLY 60-6720
Change part list to read:

| | | | | |
|---|---|---|---|---|
| S101 - S102 | RELAY SPST GOLD | 95348 | MR-306-8 | 7-38216 |

RANGE CONTROL ASSEMBLY 60-6722
Change part list to read:

| | | | | |
|---|---|---|---|---|
| S201 - S203 | RELAY SPST GOLD | 95348 | MR-306-8 | 7-38216 |

Donald D. Meyer
Customer Service Supervisor

REPAIR PARTS KIT FOR 9000 SERIES DIGITAL VOLTMETERS

CIMRON PART NUMBER 5-40028

| Quantity | Item | Part Number |
|---|---|---|
| 1 | Attenuator Assembly | 90-6001 |
| 1 | Amplifier Assembly | 90-6077 |
| 1 | Driver Assembly | 90-6075 |
| 1 | Standard Decade Assembly | 90-6047 |
| 1 | 10K Decade Assembly | 90-6048 |
| 1 | Units Pot Assembly | 90-6104 |
| 1 | Tens Pot Assembly | 90-6105 |
| 1 | Hundreds Pot Assembly | 90-6106 |
| 1 | Thousands Pot Assembly | 90-6107 |
| 1 | Ten Thousands Pot Assembly | 90-6112 |
| 1 | Range & Polarity Assembly | 90-6113 |
| 1 | Function Assembly | 90-6116 |
| 1 | Reference Assembly | 90-6140 |
| 1 | Power Supply Assembly | 90-6017 |
| 1 | Logic Tester Assembly | 90-9502-1 |
| 1 | Extension Board Assembly | 80-9501-1 |
| 1 | Reed | 7-38215 |
| 1 | Transistor 2N3686 | 9-04728 |
| 1 | Transistor 2N404A | 9-04609 |
| 2 | Transistor CT-26 | 9-04710 |
| 1 | Transistor CT-31 | 9-04800 |
| 5 | Diode CD-61 | 7-95511 |
| 1 | Transistor 2N1304 | 9-04500 |
| 1 | Transistor 2N2944 | 9-04615 |
| 2 | Transistor 4JD7A35 | 9-04718 |
| 6 | Transistor CT-25 | 9-04709 |
| 6 | S.C. 3N83 | 9-04401 |
| 6 | Reed Packs | 90-0513 |
| 10 | Reed Switch | 7-38216 |
| 1 | Transistor 2N2647 | 9-04400 |
| 1 | Transistor 2N3440 | 9-04801 |
| 1 | Transistor 2N2538 | 9-04711 |
| 1 | Transistor CT-23 | 9-04706 |
| 1 | Solenoid | 50-0501-1 |
| 1 | Solenoid | 90-0504-1 |
| 1 | Numeral Indicator | 3-41405 |
| 1 | Polarity Indicator | 3-41404 |
| 5 | Fuses 1/2 ASB | 4-08013 |
| 4 | Diodes Rect SC6 | 7-95504 |



Effective November 1, 1966

REPAIR PARTS KIT FOR 9000 SERIES DIGITAL VOLTMETERS (Cont'd)

| Quantity | Item | Part Number |
|---|---|---|
| 1 | Zener 1N708A | 7-95631 |
| 1 | Zener 1N710A | 7-95627 |
| 1 | Zener 1N712A | 7-95632 |
| 1 | Zener 1N716A | 7-95614 |
| 1 | Zener 1N714A | 7-95630 |
| 1 | Zener 1N718A | 7-95633 |
| 1 | 9000 Series Instruction Manual | |
| 1 | Spare Parts Kit Case | |

THIS KIT IS PRICED AT $3,222.35



Effective November 1, 1966

PRICE LIST FOR INDIVIDUAL SPARE PARTS AND ASSEMBLIES

CIMRON 9000 SERIES DIGITAL VOLTMETERS

| ITEM | QUANTITY PER DVM | PART NUMBER | UNIT PRICE |
|---|---|---|---|
| Input Buffer | 1 | 90-6124 (E) | $208.00 |
| Attenuator (See Note) | 1 | 90-6001 | 372.00 |
| | | 90-6159 | 356.00 |
| Amplifier | 1 | 90-6077 | 143.00 |
| | | 90-6130 (E) | 126.00 |
| Driver | 1 | 90-6075-1 | 168.00 |
| | | 90-6131 (E) | 166.00 |
| Standard Decade | 4 | 90-6047 | 222.00 |
| | | 90-6137 (E) | 183.00 |
| 10K Decade | 1 | 90-6048 | 154.00 |
| | | 90-6135 (E) | 148.00 |
| Units Pot | 1 | 90-6005 (E) | 146.00 |
| | | 90-6104 | 175.00 |
| Tens Pot | 1 | 90-6006 (E) | 173.00 |
| | | 90-6105 | 183.00 |
| Hundreds Pot | 1 | 90-6007 (E) | 196.00 |
| | | 90-6106 | 223.00 |
| Thousands Pot | 1 | 90-6008 (E) | 231.00 |
| | | 90-6107 | 258.00 |
| Ten Thousands Pot | 1 | 90-6058 (E) | 339.00 |
| | | 90-6112 | 415.00 |
| Range & Polarity | 1 | 90-6113 | 130.00 |
| | | 90-6121 (E) | 133.00 |
| Function Ratio (9300/9500) | 1 | 90-6074 | 109.00 |
| | | 90-6125 (E) | 99.00 |
| Function (9200/9400) | 1 | 90-6116 | 74.00 |
| Range Detector | 1 | 90-6088 (E) | 90.00 |
| Reference (See Note) | 1 | 90-6140 | 152.00 |
| Print Control Assembly | 1 | 90-6102 (E) | 103.00 |

NOTE: Reference and Attenuator Assemblies replaced only as a complete unit. Field effect Transistor may be changed on Attenuator Assembly.



Effective July 15, 1967

| ITEM | QUANTITY PER DVM | PART NUMBER | UNIT PRICE |
|---|---|---|---|
| Power Supply | 1 | 90-6017 | $ 83.00 |
| Print Output "A" | 1 | 90-6040 | 186.00 |
| | | 90-6122 (E) | 199.00 |
| Print Output "B" | 1 | 90-6041 | 186.00 |
| | | 90-6123 (E) | 196.00 |
| Print Output "C" | 1 | 90-6042 | 191.00 |
| Logic Tester | 1 | 90-9502-1 | 56.00 |
| Extender Board | 1 | 80-9501-1 | 37.00 |
| Extender Board | 1 | 46-9501-1 (E) | 55.00 |
| Extender Board | 1 | 90-9504-1 (E) | 99.00 |
| Extender Board | 1 | 90-9505-1 (E) | 95.00 |
| Reed | 1 | 7-38215 | 4.93 |
| Transistor 2N3686 | 1 | 9-04728 | 6.75 |
| Transistor 2N404A | 1 | 9-04609 | .88 |
| Transistor CT-26 | 2 | 9-04710 | 1.75 |
| Transistor CT-31 | 1 | 9-04800 | 3.75 |
| Diode CD-61 | 5 | 7-95511 | .33 |
| Transistor 2N1304 | 1 | 9-04500 | .93 |
| Transistor 2N2944 | 1 | 9-04615 | 9.63 |
| Transistor 4JD7A35 | 2 | 9-04718 | 3.73 |
| Transistor CT-25 | 6 | 9-04709 | 2.00 |
| S. C. 3N83 | 6 | 9-04401 | 2.50 |
| Reed Packs | 6 | 90-0513 | 10.80 |
| Reed Switch | 10 | 7-38216 | 1.28 |
| Transistor 2N2647 | 1 | 9-04400 | 1.88 |
| Transistor 2N3440 | 1 | 9-04801 | 2.83 |
| Transistor 2N2538 | 1 | 9-04711 | 14.63 |
| Transistor CT-23 | 1 | 9-04706 | 1.38 |
| Solenoid | 1 | 50-0501-1 | 2.45 |
| Solenoid | 1 | 90-0504-1 | 2.75 |
| Numeral Indicator | 1 | 3-41405 | 27.50 |
| Polarity Indicator | 1 | 3-41404 | 27.50 |
| Fuses 1/2 ASB | 5 | 4-08013 | .45 |
| Diodes Rect SC6 | 4 | 7-95504 | 1.08 |
| Zener 1N708A | 1 | 7-95631 | 5.10 |
| Zener 1N710A | 1 | 7-95627 | 5.13 |
| Zener 1N712A | 1 | 7-95632 | 5.10 |
| Zener 1N716A | 1 | 7-95614 | 5.10 |
| Zener 1N714A | 1 | 7-95630 | 5.10 |
| Zener 1N718A | 1 | 7-95633 | 5.10 |

# MAINTENANCE AND CALIBRATION

# OF CIMRON P9000B SERIES DIGITAL VOLT AND VOLT-RATIO METERS (DVM)

NOTE

When reference is made to a diagram number, the diagram can be found in Section VI of the Instruction Manual.

The basic P9000B series instruments use continuous tracking logic and measure voltages of either polarity from 0.0000 to 999.99 volts in three ranges. Polarity and range selection are automatic. For purposes of these notes, the three ranges will be identified as:

1. The ten volt range — where voltages up to 9.9999 are being measured,
2. The hundred volt range — for voltages between 10.000 and 99.999 volts,
3. The thousand volt range — for voltages between 100.00 and 999.99 volts.

The signal input voltage being measured is constantly compared to an internal reference voltage by means of a photo chopper (Diagram 5). The reference voltage is a function of an internal Kelvin Varley potentiometer supplied by a precision, stable reference voltage, the setting of which is determined by the same transistors that drive the readout. The maximum voltage across the potentiometer when in the DC function is ten volts. Therefore the signal input voltage is compared to a reference voltage which is always less than ten volts and whose exact voltage is equal to the readout indication. It follows then that the photo chopper compares two voltages both of which are less than ten volts. When signal input voltages greater than ten volts are being measured, internal circuitry divides, or attenuates, the input voltage by 10 or 100 to limit the voltage applied to the photo chopper.

The photo chopper consists of two neon bulbs as an assymetrical relaxation oscillator and two photo cells. Each neon bulb excites one photo cell. The two photo cells are connected in series between the unknown signal input voltage and the Kelvin-Varley potentiometer output (Pot Arm). The center point or tie point of the photo cells becomes the "chopper arm" which (as the cells are alternately excited by their associated neon drivers), will alternately sample or compare the input versus the pot arm.

The resulting difference (if any) is applied to the internal circuitry of the DVM, which drives the Kelvin Varley potentiometer and the readout until both inputs to the photo chopper are equal. When equality is attained, the instrument is said to be "at null". The relaxation oscillator operates at about 100 Hz. This frequency is established by selecting R119 at the factory. A 6 volt, 3 millisecond, positive pulse is developed across a resistor in one leg of the oscillator. This pulse is used to activate a gate generator in the Driver Assembly.

Due to the complexity of the instrument, it is impossible to list all possible problems, but it is hoped that these notes will enable the technician to approach the area wherein the trouble lies, and to rely on normal troubleshooting techniques to locate the defective component. The DVM will be considered first as a conventional DVM, without plug-in units, and will be checked in the DC function. Before any checks are made, remove any plug-in unit from the DVM, and place the function switch on DC.

It is assumed that the technician performing the following tests has had some experience in troubleshooting techniques and soldering on etch board assemblies. It is also assumed that all internal voltages in the DVM are correct as regards both value and ripple according to the instruction manual. Voltage test points are accessible through the top, inner shield.

NOTE

Extender board P/N 80-9501 is required for some of the following checks and is available from the factory at a cost of $37.00.

With power applied to the instrument and the input leads (red and black) shorted together, all nixies should light, including the polarity sign and decimal point, and the DVM should display all zeros.

OPEN INPUT

With the input leads shorted the DVM may wander, indicating an open input. Check the input cable connection (diagram 3). The red lead goes to "A" on the connector, and the black lead goes to "C". If the input cable is good, reconnect it to the DVM. The input signal is directed to the DVM input via the Input Selector Assembly. The function of the Input Selector is to direct the input signal to either the DVM or to a plug-in unit. When in DC function, the input signal is directed to the DVM input. The Input Selector is located under the shield directly behind the plug-in compartment. Access is gained by removing three screws and folding the shield forward. With the input leads shorted as above, continuity should exist across "AT HI" and "AT LO". If no short exists, check the two fuses (#34 wire) located on the top side of the board. If these show continuity, check from the red input lead to "AT HI". If this shows open, check the gold plated etch under Printact relay K12. The relay can be removed by using a small-blade screwdriver and prying against the U-shaped clamp that mounts the relay to the board. The gold plating should be clean and free from corrosion or tarnish. The plating is very thin, but may be polished with a piece of paper towelling. Rub the etch just enough to brighten the gold plating.

Looking at diagram 4, it will be seen that, when in DC function, K12 is energized, while K34 and K56 are in their normal condition, as per note 2. Thus, if the gold etch appears clean, and the open condition still exists, check the DC resistance of the coil. On relays marked 18BW3G the coil will measure approximately 675Ω, while the 12BW3G coil measures approximately 300Ω. It is possible to find either of these two types of relays, depending upon the serial number of the DVM (see Field Service Bulletin No. 115 enclosed).

There is the possibility also that CR4 on the Input Selector, or CR18 on the Function Ratio Assembly (diagram 18) is open. Neither of these cases, however, has occurred to date.

Similar to above, the signal low black lead should measure as a short circuit to AT LO point on the Input Selector (diagram 3). The possible problems are fewer here, but can be found in the same manner as above.

The signal paths from the Input Selector go on thru separate wires, to the Attenuator Assembly (diagram 5). This is the yellow circuit board marked (10). This mark is on the "A" or back side of the board, as well as on the rail opposite the slot in which the board belongs. Still considering the same problem, the possibility exists that either (or both) of the wires, from the Input Selector to the Master Board is broken. This, however, has not been a problem in the past.

LOW SENSITIVITY OR SLUGGISHNESS

Keeping in mind the fact that the Tri-Hexanary logic says the DVM will count by odd numbers when counting in the UP direction, it is evident that if the Units' decade won't count from, say, 5 to 6, but goes from 5 to 7, the sensitivity is insufficient (or misadjusted).

While there are any number of reasons that can cause this apparent loss of sensitivity, we will assume for now that the DC supplies for the various amplifier stages are satisfactory.

Experience has shown that the most likely area to cause this problem is the photo-cell chopper. Before jumping to conclusions, however, several things have to be known about Cesium photo cells.

1. A photo cell is generally understood to be some 2-element device, in which one element actually emits electrons when it is exposed to a light source (photo-emissive). These electrons are absorbed, or collected, by the other element; thus we have current flow when element #1 is exposed to light. The photo cells used in the P9000B series DVM are not electron emitting elements, but might more accurately be called "light-variable resistors" (photo-conductive). That is, the resistance of one of these cells in the "dark" or "off" condition is specified to be >50 megohms; while in the "lit" or "on" condition the resistance is <2.3 KΩ. (The on-resistance assumes a certain light level, which, for purposes of this discussion, is reached).

2. Cells of the Cs variety have a "memory"; i.e., awareness of their environment (dark or light). This means simply that if a cell has been stored in the dark (DVM turned off) for an extended period, it will take some time for the cell to react to light again, when the DVM is turned on. Thus the necessity for the specified "warm-up" time.

3. In order to have an effective chopper, the "arm" of the chopper must see something approaching an open circuit on one side, and a short circuit to the source being sampled on the other side at any given instant; and this "arm" must be able to get from one side to the other with the least possible delay, or lag.

   This says that two characteristics must be considered.

   a. Efficiency, i.e., the ability to vary in resistance from >50 MΩ to <2.3 KΩ.

   b. Response, i.e., the speed with which the cell can change from one condition to the other — full on to full off, if you will. While the cell never reaches a completely short circuit condition (nor a fully open, for that matter), for practical purposes, the ratio of >50 MΩ to <2.3 KΩ equals infinity/zero. And the proof of this is the success of the P9000B series DVM.

4. Cs cells may get "old and tired". After X hours of exposure to light, the efficiency and the response of a cell may decrease. X equals many thousands of hours, and while no time has been established, there appears to be a definite "knee" in the lifecurve, i.e., if they start to fade they are done for. (To set your mind at ease, we have had 3 cases of this over a period of 2-1/2 years).

Knowing these things, it should be apparent that one should not attempt to check the sensitivity of this DVM immediately after turn-on (2 above). It also becomes apparent why the "misadjusted" is parenthesized in the first paragraph. Again, experience has shown a tendency of the user to compensate for the lack of resolution simply by cranking up the over-all "Gain Adjustment" on the Amplifier; when, in reality, what is needed is proper "Balance" adjustment. That is, balance to the point where the UP and DOWN drivers fire at exactly the same level of error signal. The result of this erroneous increase in over-all gain is that the DVM will appear noisy, or unable to settle on a given number, call it rattle, chatter, or whatever.

In order to set the Driver Assembly (diagram 7) Gain and Balance adjustments properly, it is necessary to have an oscilloscope, which can be synchronized by an external trigger. Also required is a continuously variable voltage divider, such as a Dekavider. (A 10-turn pot can be used, but it must have a counter-type knob on it, calibrated in at least 1/10 turn divisions preferably 1/100 turn divisions).

Connect the 'scope as follows:

Gnd. to Com lug on Power Supply Assembly

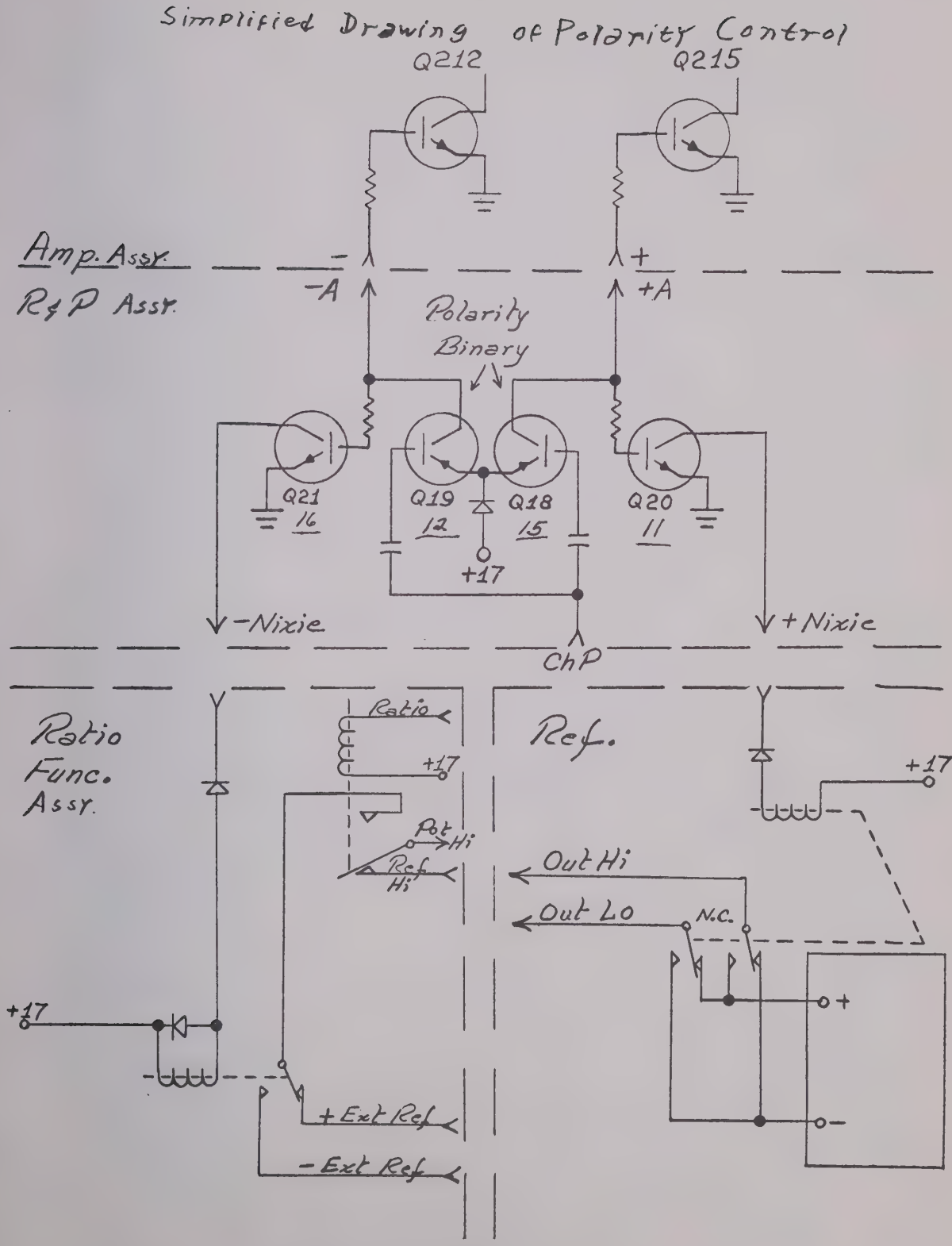
+ Ext. Trig. to TP14 on Driver Assembly

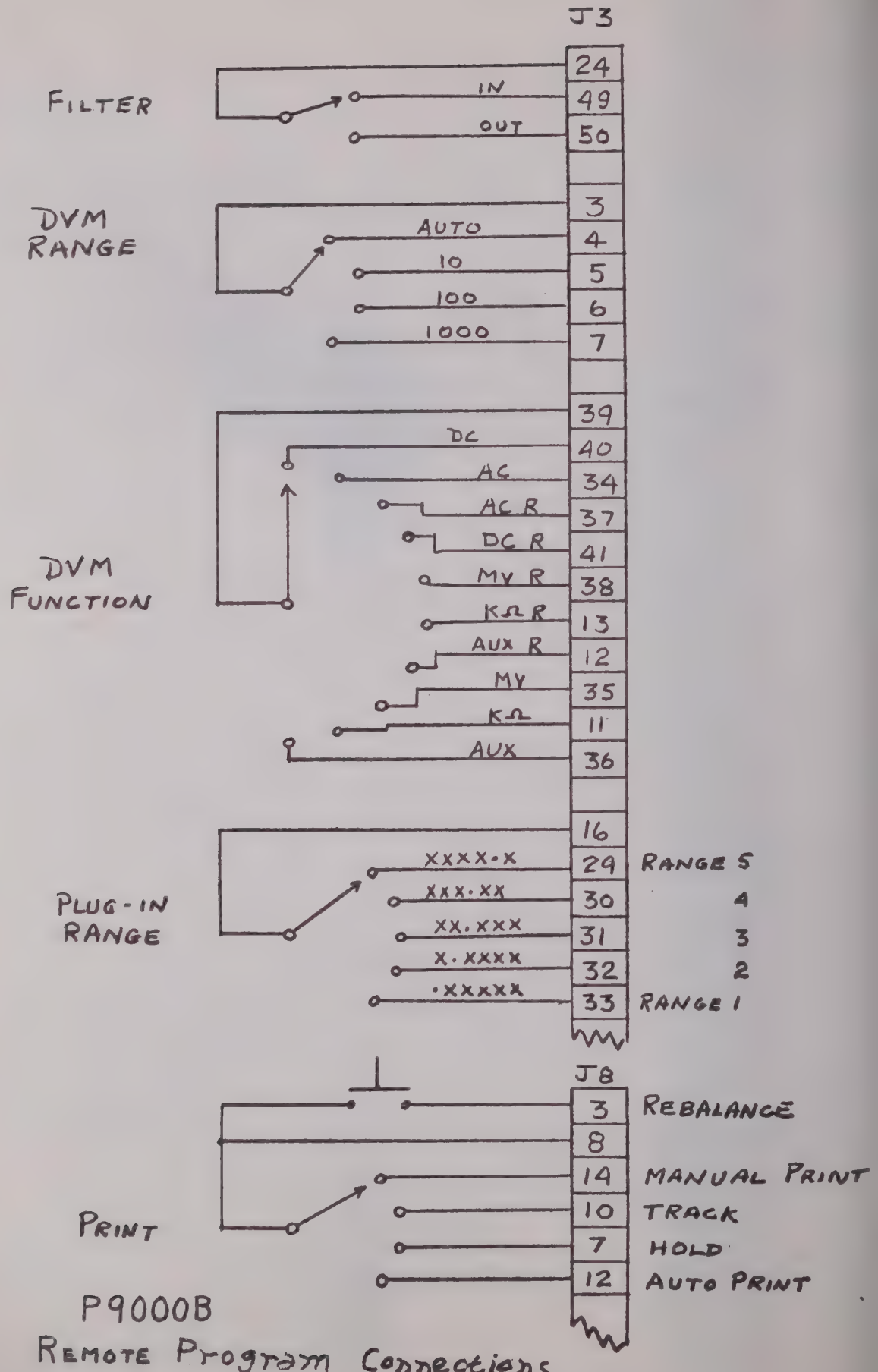
Signal In to TP13 on Driver Assembly

When using the DVM (Models 9300 and 9500 only) as a Ratiometer, it is possible to have the same situation occur, i.e., a difference in + and - readings. In this case, K7401 on the Function Ratio Assembly (diagram 18) is the likely offender. The same procedure is used to clean the etch under the relay as in the previous case.

Keep in mind that when the DVM is used in the Ratio mode, the only change that has been made is that an external voltage is used as the reference supply for the Kelvin-Varley Potentiometer. The external supply takes the place of the internal reference supply. We must have some means of switching references, and this is accomplished by K7402 on the Function Ratio Assembly. K7402 in its normal condition, as shown, allows REF HI (the internal Reference) to be applied to the high side of the K-V Potentiometer (POT HI).

Following the lead from the driven side of K7402 coil over to the left and through the matrix, it will be seen that this relay is energized in any of the 5 ratio functions. Consider the DC Ratio (DCR) function. When in this function, a ground (common) is applied at the pin marked DCR. This, thru CR33, in turn applies a virtual ground (+0.7V or so) at the driven end of coil K7402, energizing it and allowing the POT HI to be switched to external reference. The polarity of this, as was mentioned, is determined by the position of K7401.

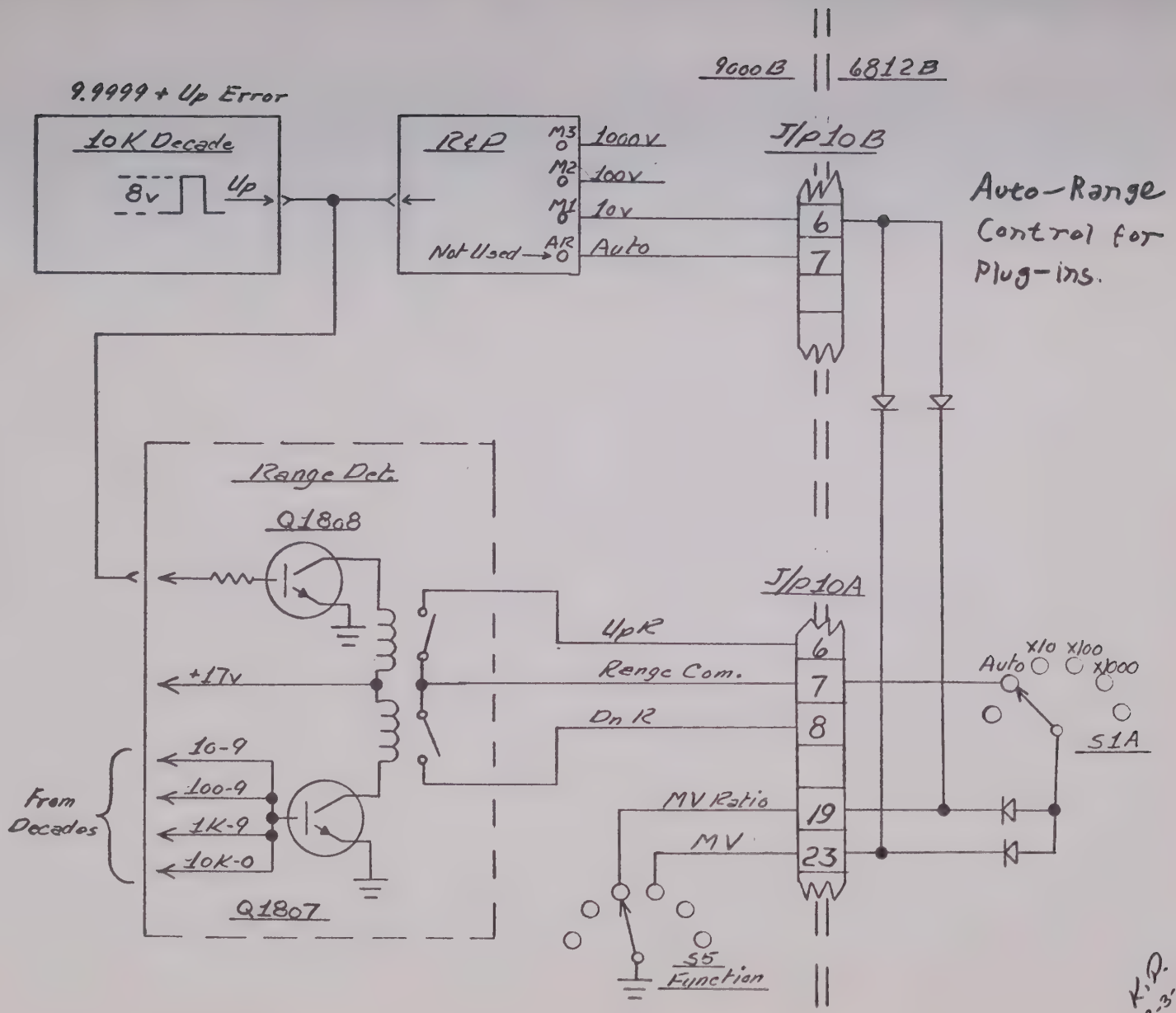

Simplified Drawing of Polarity Control
Q212
Q215
Amp. Assy.
R & P Assy.
-
+
-A
+A
Polarity Binary
Q21
16
Q19
12
Q18
15
Q20
11
+17
-Nixie
+Nixie
ChP
Ratio Func. Assy.
Ratio
+17
Pot Hi
Ref Hi
Ref.
+17
Out Hi
Out Lo
N.C.
+17
+Ext Ref
-Ext Ref




P9000B

REMOTE PROGRAM CONNECTIONS

11.8.65 RM.


9000B
6812B
9.9999 + Up Error
10K Decade
8v
Up
R&P
M3
M2
M1
AR
1000v
100v
10v
Auto
Not Used
J/P10B
6
7
Auto-Range Control for Plug-ins.
Range Det.
Q1808
+17v
10-9
100-9
1K-9
10K-0
From Decades
Q1807
J/P10A
UpR
Range Com.
Dn R
8
MV Ratio
19
MV
23
S5 Function
Auto
x10
x100
x1000
S1A
K.P. 2-3-66

CIMRON DIVISION
LEAR SIEGLER, INC. LSi
MORENA BOULEVARD SAN DIEGO, CALIFORNIA 92110 A.C. 714 • 276-3200

April 14, 1965 FIELD SERVICE BULLETIN Issue 110

To: All Customers with Model 9500B-355 Digital Volt-Ratio Meter.

Instrument Affected: Model 9500B-355, Model 9500B-504 Digital Volt-Ratio Meter.

Reason for Issuance: Maintenance information and corrections to Manual Parts Lists.

Action Required: Note maintenance information. Correct part numbers in Manual Parts Lists.

Reed relay MR-306-8 (Cimron part number 7-38216) is specified replacement for all reed relays MRG-1 (Cimron part number 7-38207) and MRR-1 (Cimron part number 7-38209).

RANGE AND POLARITY ASSEMBLY 90-6011
Change parts list to read:

| | | | | |
|---|---|---|---|---|
| S1101, S1102A & B | RELAY SPST GOLD | 95348 | MR-306-8 | 7-38216 |

FUNCTION RATIO ASSEMBLY 90-6013
Change parts list to read:

| | | | | |
|---|---|---|---|---|
| S1301 - S1305 | RELAY SPST GOLD | 95348 | MR-306-8 | 7-38216 |

RANGE DETECTOR ASSEMBLY 90-6018
Change parts list to read:

| | | | | |
|---|---|---|---|---|
| S1801, S1802 | RELAY SPST GOLD | 95348 | MR-306-8 | 7-38216 |

OUTPUT BUFFER 90-6028 of PRINT OUTPUT ASSEMBLY
Change parts list to read:

| | | | | |
|---|---|---|---|---|
| S2801 - S2824 | RELAY SPST GOLD | 95348 | MR-306-8 | 7-38216 |

INPUT BUFFER SUBASSEMBLY
Change parts list to read:

| | | | | |
|---|---|---|---|---|
| S2401 - S2417 | RELAY SPST GOLD | 95348 | MR-306-8 | 7-38216 |

Donald L. Meyer
Customer Service Supervisor

CIMRON DIVISION
LEAR SIEGLER, INC. LSi
2 MORENA BOULEVARD SAN DIEGO, CALIFORNIA 92110 A.C. 714 • 276-3200

December 17, 1965 | FIELD SERVICE BULLETIN | Issue 115

To: All customers with Series P9000B Instruments.

Instruments Affected: Digital Voltmeters Model 9200B, S/N's 4497 and below.
Digital Volt-Ratio Meters Model 9300B, S/N's 4376 and below.
Digital Volt-Ratio Meters Model 9500B, S/N's 4364 and below.
Digital Voltmeters Model 9400B, S/N's 4313 and below.

Reason for Issuance: Improvement of reliability.

Action Required: All customers with equipment affected may request replacement parts and documentation supplements, at no charge, by contacting the Customer Relations Department of Cimron.

It has become apparent that reliability improvement of the Series P9000B can be achieved by the following changes:

I. Replacement of 5 each 18 volt 3 PDT relays, Cimron P/N 7-38214 with 12 volt 3 PDT relays P/N 7-38215.

| Schematic Designation | Location |
|---|---|
| K1 | Reference Assembly 90-6049 |
| K7401 & K7402 | Function Ratio Assembly 90-6074 |
| K12 & K56 | Input Selector Assembly 90-6079 |

II. Replacement of Range & Polarity Assembly 90-6046.

Donald K. Meyer
Customer Service Supervisor

# REPAIR PARTS KIT FOR 6700B AC-DC CONVERTER

## CIMRON PART NUMBER 5-40030

| Quantity | Item | Part Number |
|---|---|---|
| 1 | Amplifier Assembly | 67-6002 |
| 1 | Output Assembly | 67-6003 |
| 1 | Power Supply | 67-6005 |
| 1 | Extension Board Assembly (Short) | 67-6041-1 |
| 2 | Fuse, 1/10A, S.B. | 4-08100 |
| 1 | Capacitor, 100 MFD 20V | 1-57103 |
| 1 | Capacitor, 250 MFD 50V | 1-57202 |
| 1 | Capacitor, 100 MFD 25V | 1-57206 |
| 1 | Capacitor, 1000 MFD 25V | 1-57212 |
| 1 | Capacitor, 50 MFD 25V | 1-57225 |
| 1 | Diode, FD-600 | 7-95506 |
| 2 | Diode, CD-62 | 7-95507 |
| 2 | Diode, CD-61 | 7-95511 |
| 1 | Transistor, 2N398B | 9-04612 |
| 1 | Transistor, CT-20 | 9-04701 |
| 1 | Transistor, CT-25 | 9-04709 |
| 1 | Transistor, CT-26 | 9-04710 |
| 1 | Transistor, 2N3686 (diagram) | 9-04725 |
| 1 | Transistor, CT-31 | 9-04500 |
| 1 | 6700B Instruction Manual | |
| 1 | Spare Parts Kit Case | |

THIS KIT IS PRICED AT $513.87.

Effective November 1, 1966

REPAIR PARTS KIT FOR 6701B AC-DC CONVERTER

CIMRON PART NUMBER 5-40032

| Quantity | Item | Part Number |
|---|---|---|
| 1 | Power Supply Assembly | 67-6013 |
| 1 | Amplifier Assembly | 67-6014 |
| 1 | Output Assembly | 67-6015 |
| 1 | Extension Board Assembly (Short) | 60-9501-1 |
| 2 | Fuse, 1/10A, S.B. | 4-08100 |
| 1 | Capacitor, 100 MFD 20V | 1-57103 |
| 1 | Capacitor, 2.2 MFD 20V | 1-57104 |
| 1 | Capacitor, 50 MFD 25V | 1-57228 |
| 1 | Capacitor, 100 MFD 25V | 1-57253 |
| 1 | Capacitor, 50 MFD 50V | 1-57257 |
| 1 | Diode FD-600 | 7-95506 |
| 2 | Diode CD-62 | 7-95507 |
| 1 | Diode CD-61 | 7-95511 |
| 1 | Transistor 2N398B | 9-04612 |
| 1 | Transistor CT-20 | 9-04701 |
| 1 | Transistor CT-22 | 9-04709 |
| 2 | Transistor CT-26 | 9-04710 |
| 1 | Transistor 2N3686 | 9-04728 |
| 1 | 6701B Instruction Manual | |
| 1 | Spare Parts Kit Case | |

THIS KIT IS PRICED AT $372.31.

Effective November 1, 1966

REPAIR PARTS KIT FOR 6710B AC-DC CONVERTER

CIMRON PART NUMBER 5-40033

| Quantity | Item | Part Number |
|---|---|---|
| 1 | AC Amplifier Assembly | 67-6022 |
| 1 | Output Amplifier Assembly | 67-6023 |
| 1 | Power Supply Assembly | 67-6025 |
| 1 | ±22V Power Supply Assembly | 67-6028 |
| 1 | Range Control Assembly | 67-6029 |
| 1 | Extension Board Assembly (Short) | 60-9501-1 |
| 2 | Fuse, 1/10A, S.B. | 4-08100 |
| 1 | Capacitor 50 MFD 25V | 1-57228 |
| 2 | Capacitor 100 MFD 25V | 1-57253 |
| 1 | Capacitor 50 MFD 50V | 1-57257 |
| 1 | Capacitor 20 MFD 100V | 1-57261 |
| 1 | Capacitor 10 MFD 150V | 1-57264 |
| 1 | Diode FD-600 | 7-95506 |
| 2 | Diode CD-62 | 7-95507 |
| 3 | Diode CD-61 | 7-95511 |
| 2 | Reed Relay | 7-38216 |
| 1 | Transistor 2N2647 | 9-04400 |
| 1 | Transistor 2N398B | 9-04612 |
| 1 | Transistor CT-23 | 9-04706 |
| 1 | Transistor CT-25 | 9-04709 |
| 2 | Transistor CT-26 | 9-04710 |
| 1 | Transistor 2N2989 | 9-04714 |
| 1 | Transistor CT-31 | 9-04800 |
| 1 | 6710B Instruction Manual | |
| 1 | Spare Parts Kit Case | |

THIS KIT IS PRICED AT $516.04.

Effective November 1, 1966

REPAIR PARTS KIT FOR 6801B & 6802B DC PREAMPLIFIERS

CIMRON PART NUMBER 5-40031

| Quantity | Item | Part Number |
|---|---|---|
| 1 | Input Amplifier Assembly | 60-6107 |
| 1 | Demodulator Assembly | 60-6108 |
| 1 | Output Amplifier Assembly | 60-6109 |
| 1 | Power Supply Assembly | 60-6111 |
| 1 | Extension Board Assembly (Short) | 60-9501-1 |
| 2 | Fuse 1/10A, S.B. | 4-08100 |
| 1 | Capacitor 100 MFD 20V | 1-57103 |
| 1 | Capacitor 250 MFD 50V | 1-57202 |
| 1 | Capacitor 100 MFD 25V | 1-57206 |
| 3 | Diode CD-62 | 7-95507 |
| 3 | Diode CD-61 | 7-95511 |
| 1 | Transistor 2N1760 | 9-04601 |
| 1 | Transistor CT-20 | 9-04701 |
| 1 | Transistor CT-26 | 9-04710 |
| 1 | Chopper | 1-92001 |
| 1 | 6801B & 6802B Instruction Manual | |
| 1 | Spare Parts Kit Case | |

THIS KIT IS PRICED AT $554.95.

Effective November 1, 1966

REPAIR PARTS KIT FOR 6812B DC PREAMPLIFIER

CIMRON PART NUMBER 5-40034

| Quantity | Item | Part Number |
|---|---|---|
| 1 | Carrier Amplifier Assembly | 68-6002 |
| 1 | Post Amplifier Assembly | 68-6003 |
| 1 | Power Supply Assembly | 68-6004 |
| 1 | Range Control Assembly | 68-6005 |
| 1 | Extension Board Assembly (Short) | 60-9501-1 |
| 2 | Fuse 1/4A, S.B. | 4-08012 |
| 2 | Reed Relay | 7-38216 |
| 1 | Diode CD-63 | 7-95503 |
| 3 | Diode CD-62 | 7-95507 |
| 3 | Diode CD-61 | 7-95511 |
| 1 | Transistor 2N2647 | 9-04400 |
| 1 | Transistor CT-23 | 9-04706 |
| 1 | Transistor CT-26 | 9-04710 |
| 1 | Transistor 2N3567 | 9-04719 |
| 1 | Transistor 3638 | 9-04722 |
| 1 | Transistor 40250 | 9-04723 |
| 1 | Transistor 2N3565 | 9-04725 |
| 1 | Capacitor 47 MFD 35V | 1-57107 |
| 2 | Capacitor 100 MFD 25V | 1-57253 |
| 1 | Capacitor 50 MFD 50V | 1-57257 |
| 1 | Chopper | 1-92001 |
| 1 | 6812B Instruction Manual | |
| 1 | Spare Parts Kit Case | |

THIS KIT IS PRICED AT $513.91.

Effective November 1, 1968

REPAIR PARTS KIT FOR 6869B OHMS-PREAMPLIFIER

CIMRON PART NUMBER 5-40035

| Quantity | Item | Part Number |
|---|---|---|
| 1 | Attenuator Assembly | 68-6001 |
| 1 | Carrier Amplifier Assembly | 68-6002 |
| 1 | Post Amplifier Assembly | 68-6003 |
| 1 | Power Supply Assembly | 68-6004 |
| 1 | Range Control Assembly | 68-6005 |
| 1 | Chopper Drive Assembly | 68-6006 |
| 1 | Attenuator Assembly | 69-6011 |
| 1 | Carrier Amplifier Assembly | 69-6012 |
| 1 | DC Amplifier Assembly | 69-6013 |
| 1 | Reference Assembly | 69-6014 |
| 1 | Oscillator Assembly | 69-6015 |
| 1 | Range Control Assembly | 69-6016 |
| 1 | Power Supply Assembly | 69-6017 |
| 1 | Extension Board Assembly (Short) | 60-9501-1 |
| 2 | Fuse 1/4A, S.B. | 4-08012 |
| 1 | Capacitor 22 MFD 35V | 1-57102 |
| 1 | Capacitor 100 MFD 20V | 1-57103 |
| 1 | Capacitor 100 MFD 50V | 1-57211 |
| 1 | Capacitor 25 MFD 25V | 1-57223 |
| 1 | Capacitor 25 MFD 15V | 1-57224 |
| 1 | Capacitor 50 MFD 25V | 1-57228 |
| 1 | Capacitor 300 MFD 6V | 1-57243 |
| 3 | Capacitor 100 MFD 25V | 1-57253 |
| 2 | Capacitor 50 MFD 50V | 1-57257 |
| 2 | Chopper | 1-92001 |
| 1 | Relay, Printact 18-BW3-G | 7-38214 |
| 1 | Relay, Printact 12-BW3-G | 7-38215 |
| 3 | Relay, Reed | 7-38216 |
| 1 | Diode CD-63 | 7-95503 |
| 5 | Diode CD-62 | 7-95507 |
| 3 | Diode CD-61 | 7-95511 |
| 1 | Transistor 2N2647 | 9-04400 |
| 2 | Transistor CT-20 | 9-04701 |
| 2 | Transistor CT-23 | 9-04706 |
| 3 | Transistor CT-26 | 9-04710 |
| 3 | Transistor 2N3567 | 9-04719 |
| 2 | Transistor 2N3638 | 9-04722 |



Effective November 1, 1966

REPAIR PARTS KIT FOR 44442 OHMS-PREAMPLIFIER (Con't)

| Quantity | Item | Part Number |
|---|---|---|
| 2 | Transistor 40250 | 9-04723 |
| 1 | Transistor 2N3565 | 9-04725 |
| 1 | Transistor CT-31 | 9-04300 |
| 1 | 44442 Instruction Manual | |
| 1 | Spare Parts Kit Case | |

THIS KIT IS PRICED AT $1,373.41.

Effective November 1, 1969

REPAIR PARTS KIT FOR 6911B OHMS-DC CONVERTER

CIMRON PART NUMBER 5-40088

| Quantity | Item | Part Number |
|---|---|---|
| 1 | Attenuator Assembly | 69-6001 |
| 1 | Carrier Amplifier Assembly | 69-6002 |
| 1 | DC Amplifier Assembly | 69-6003 |
| 1 | Reference Assembly | 69-6004 |
| 1 | Oscillator Assembly | 69-6005 |
| 1 | Power Supply Assembly | 69-6006 |
| 1 | Extension Board Assembly (Short) | 60-9501-1 |
| 2 | Fuse 1/10A, S.B. | 4-08100 |
| 2 | Diode CD-62 | 7-95507 |
| 3 | Diode CD-61 | 7-95511 |
| 1 | Diode 1N722 | 7-95612 |
| 1 | Diode 1N945 | 7-95619 |
| 1 | Transistor 2N1304 | 9-04500 |
| 1 | Transistor 2N382 | 9-04600 |
| 1 | Transistor 2N404A | 9-04609 |
| 2 | Transistor CT-20 | 9-04701 |
| 2 | Transistor CT-26 | 9-04710 |
| 1 | Chopper | 1-92001 |
| 1 | 6911B Instruction Manual | |
| 1 | Spare Parts Kit Case | |

THIS KIT IS PRICED AT $826.55.

Effective November 1, 1966

REPAIR PARTS KIT FOR 6912B DC PREAMPLIFIER

CIMRON PART NUMBER 5-40036

| Quantity | Item | Part Number |
|---|---|---|
| 1 | Carrier Amplifier Assembly | 69-6012 |
| 1 | DC Amplifier Assembly | 69-6013 |
| 1 | Range Control Assembly | 69-6016 |
| 1 | Power Supply Assembly | 69-6017 |
| 1 | Extension Board Assembly (Short) | 60-9501-1 |
| 2 | Fuse, 1/4A, S.B. | 4-08012 |
| 2 | Reed Relay | 7-38216 |
| 1 | Diode, CD-62 | 7-95507 |
| 3 | Diode, CD-61 | 7-95511 |
| 1 | Diode, Zener, 1N750 | 7-95608 |
| 1 | Diode, Zener, 1N719 | 7-95610 |
| 1 | Diode, Zener, 1N722 | 7-95612 |
| 1 | Capacitor 22 MFD 35V | 1-57102 |
| 1 | Capacitor 100 MFD 20V | 1-57103 |
| 1 | Capacitor 100 MFD 25V | 1-57253 |
| 1 | Capacitor 50 MFD 50V | 1-57257 |
| 1 | Chopper | 1-92001 |
| 1 | Transistor 2N2647 | 9-04400 |
| 2 | Transistor CT-20 | 9-04701 |
| 1 | Transistor CT-23 | 9-04706 |
| 2 | Transistor CT-26 | 9-04710 |
| 1 | Transistor 2N3638 | 9-04722 |
| 1 | Transistor 40250 | 9-04723 |
| 1 | Transistor CT-31 | 9-04800 |
| 1 | Relay, Printact 18V | 7-38214 |
| 1 | 6912B Instruction Manual | |
| 1 | Spare Parts Kit Case | |

THIS KIT IS PRICED AT $606.22.

Effective November 1, 1966

REPAIR PARTS KIT FOR 6950B DC STABLE SOURCE

CIMRON PART NUMBER 5-40037

| Quantity | Item | Part Number |
|---|---|---|
| 1 | Preamplifier Assembly | 69-6021 |
| 1 | Driver Assembly | 69-6022 |
| 1 | Output Assembly | 69-6023 |
| 1 | Extension Board Assembly (Short) | 60-9501-1 |
| 2 | Fuse, 1/4A, S.B. | 4-08012 |
| 2 | Diode CD-61 | 7-95511 |
| 1 | Transistor CT-20 | 9-04701 |
| 1 | Transistor CT-22 | 9-04705 |
| 2 | Transistor CT-26 | 9-04710 |
| 1 | Transistor 2N3583 | 9-04721 |
| 1 | Transistor 2N3638 | 9-04722 |
| 1 | 6950B Instruction Manual | |
| 1 | Spare Parts Kit Case | |

THIS KIT IS PRICED AT $662.86.

Effective November 1, 1966

REPAIR PARTS KIT FOR 6980B MULTIMETER CONVERTER

CIMRON PART NUMBER 5-40029

| Quantity | Item | Part Number |
|---|---|---|
| 1 | Reference Assembly | 69-6074 |
| 1 | Carrier Amplifier Assembly | 69-6075 |
| 1 | Output Amplifier Assembly | 69-6076 |
| 1 | MV-Ohms Attenuator Assembly | 69-6077 |
| 1 | Input-Output Selector Assembly | 69-6079 |
| 1 | AC Attenuator Assembly | 69-6081 |
| 1 | Chopper Oscillator Assembly | 69-6115 |
| 1 | Power Supply Assembly | 69-6116 |
| 1 | AC Rectifier & Filter Assembly | 69-6117 |
| 1 | Extension Board Assembly (Short) | 60-9501-1 |
| 2 | Fuse, 1/4A, S.B. | 4-08012 |
| 2 | Capacitor 100 MFD 20V | 1-57103 |
| 1 | Capacitor 2.2 MFD 35V | 1-57104 |
| 1 | Capacitor 4.7 MFD 35V | 1-57106 |
| 1 | Capacitor 2.2 MFD 20V | 1-57108 |
| 1 | Capacitor 22 MFD 75V | 1-57109 |
| 1 | Capacitor 10 MFD 20V | 1-57112 |
| 1 | Capacitor 50 MFD 15V | 1-57218 |
| 1 | Capacitor 25 MFD 25V | 1-57223 |
| 1 | Capacitor 50 MFD 25V | 1-57228 |
| 1 | Capacitor 100 MFD 25V | 1-57253 |
| 1 | Capacitor 50 MFD 50V | 1-57257 |
| 1 | Capacitor 20 MFD 100V | 1-57261 |
| 1 | Capacitor 10 MFD 150V | 1-57264 |
| 1 | Chopper | 1-92001 |
| 1 | Relay, Printact 12-BW3-G | 7-38215 |
| 3 | Relay, Reed | 7-38216 |
| 1 | Diode CD-63 | 7-95503 |
| 1 | Diode FD-600 | 7-95506 |
| 4 | Diode CD-62 | 7-95507 |
| 3 | Diode CD-61 | 7-95511 |
| 1 | Transistor 2N398B | 9-04612 |
| 1 | Transistor CT-20 | 9-04701 |
| 1 | Transistor CT-25 | 9-04709 |
| 2 | Transistor CT-26 | 9-04710 |
| 1 | Transistor 2N3686 | 9-04728 |
| 1 | Transistor CT-31 | 9-04800 |
| 1 | 6980B Instruction Manual | |
| 1 | Spare Parts Kit Case | |

THIS KIT IS PRICED AT $1, 496.31.

Effective November 1, 1966

# MAINTENANCE AND CALIBRATION OF CIMRON DC PREAMPLIFIERS

The family of Cimron DC Preamplifiers consists of the following units: 6801A, 6802A, 6801B, 6802B, 6812B, 6869B, 6880, and 6980B. The following table shows their capabilities:

| MODEL | GAIN RANGES | MANUAL AUTO | USED WITH |
|---|---|---|---|
| 6801A | X10, X100 | MAN | 6000 & 7000 Series Digital Voltmeters |
| 6802A | X10, X100, X1000 | MAN | 6000 & 7000 Series Digital Voltmeters |
| 6801B | X10, X100 | MAN | 8000 & 9000 Series Digital Voltmeters |
| 6802B | X10, X100, X1000 | MAN | 8000 & 9000 Series Digital Voltmeters |
| 6812B | X10, X100, X1000 | AUTO & MAN | 8000 & 9000 Series Digital Voltmeters |
| 6869B | X10, X100, X1000 | AUTO & MAN | 7600, 8000, & 9000 Series Digital Voltmeters |
| 6880 | X10, X100, X1000 | AUTO | 3600 & 7600 Series Digital Voltmeters |
| 6980B | X10, X100 | MAN | 8000 & 9000 Series Digital Voltmeters |

The purpose of the following notes is to help the user to maintain and calibrate the above units and to avoid unnecessary "downtime". Extender board #60-9501 is necessary to service all units except the 6880, which requires Extender board #76-9501-11. All values of ripple voltages will be expressed in peak to peak voltages, and all DC values will be referenced to the Preamplifier Common.

## 6801A, 6802A, 6801B, 6802B

The basic circuitry of the 6801A, 6802A, 6801B and 6802B is identical, therefore, they will be discussed as one. Ninety percent of the problems which show up as varying degrees of instability are traceable to the power supply or the chopper.

The power supply assembly consists of a plus and minus regulated 22 volts supply and a separate -20 volt supply. The -20 volt supply is used to power the chopper drive coil oscillator and shows in the order of .5V ripple. This supply rarely gives trouble.

The regulated power supplies should measure within 10% of 22 volts, and the ripple on both the supplies should be in the order of 1 MV. The most common failures on this assembly are C505 and C506, 250 uf/50V. The DC voltage across the capacitors should be 35 volts and the ripple about 1 volt. On occasion the 100 uf 25V (C503, C504) from the base of the passing transistors to common will fail, resulting in a noisy output or low voltage.

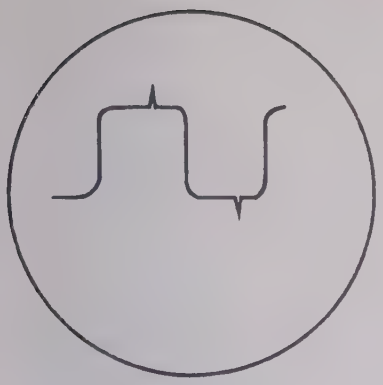
In order to check the condition of the chopper, the feedback circuit must be opened. Under normal operation, the chopper generates a square wave which is amplified by the Input Amplifier and rectified to DC by the Demodulator Assembly, and the resulting DC is used to drive the Output Amplifier assembly. The output of this assembly which drives the DVM, is fed back to the chopper through a feedback gain switching network, thus completing the loop. Therefore, the circuit is self-correcting, and no chopped waveform is visible. When any Preamplifier is being used, the DVM is locked in its 10V range, and it sees voltages less than 10 volts at its input. As an example, a Preamplifier used on the X100 range and reading +86.294 MV will deliver +8.6294 volts to the DVM.

The feedback loop can be readily broken by removing the output amplifier assembly. Removing this assembly will not harm the unit. Under this condition a small DC signal may be fed to the Preamplifier and the chopped waveform may be viewed at the output (C105, 1.0 uf) of the Input Amplifier assembly. Therefore, to examine the chopper waveform and condition:

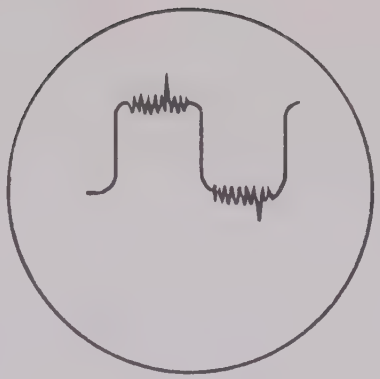
1. Remove Output Amplifier Assembly.
2. Switch Preamplifier to the X10 range.
3. Connect scope to C105. This is the large yellow capacitor mounted at the bottom center of the assembly. Set the scope for 20 mv/cm and sync for internal.
4. Apply 1 MV to the input leads.

The resulting trace should be about 45 MV in amplitude, and should represent a square wave with rounded corners as shown in figure 1.

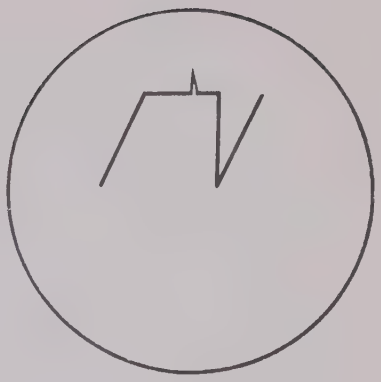
Note that there is a spike just before the trailing edge of the square wave. This is due to the application of the pulse to the chopper drive coil and represents the phase angle or time lag between the application of the pulse to the chopper drive coil and the resulting contact closure in that particular chopper. The spike remains stationary, and does not affect the operation of the Preamplifier.



1
Correct Waveform



2
Contact Bounce



3
Excessive Lag Time

A good Preamplifier which is thoroughly warm and which has not been disturbed for some time will show less than 4 digits variation in the units window with shorted input leads and when the gain is set to the most sensitive range.

There is one internal adjustment on the Preamplifier. This is R309, which sets the balance of the differential amplifier. Experience has shown the best method to adjust this is as follows:

1. Position the Preamplifier to the maximum gain.
2. Short the input leads.
3. Connect a short clip lead from the arm of the zero adjust control R13 (center terminal) to the Preamplifier common (shield of Demodulator Assembly). This will remove all effect of the zero adjustment control.
4. Adjust R309 for zero on the DVM. If R309 reaches an extremity during the adjustment R310 may be changed from 82K 1/2W to 68K 1/2W.

The previous checks should be carried out and the Preamplifier must be stable before any calibration is attempted. The unit must be thoroughly warm and the zero adjust set on the maximum gain range with the input leads shorted.

Two units are required for proper calibration on all Cimron DC Preamplifiers, a stable 9 volt supply and a ESI Divider Model CA1288 or equivalent. Calibration of the Preamplifier should be straightforward. On some units a 47K - 100K 1/2W resistor has been added across R15 (109.8Ω) in order to set the X1000 calibration adjustment R16 to the center of its range.

## 6812B and 6869B

In general, the remarks which pertain to the 6802A and 6802B Series are applicable to the 6812B and the preamplifier section of the 6869B. The assemblies are identical in both units.

The Power Supply assembly 68-6004, although more complex than the 6802A and 6802B Series, has no history of failure at the time of this writing (Nov. 66). It delivers plus and minus 22 volts, and +18 volts to power the internal reed switches. The +18 volt supply is called the Coil Supply (CS) and shows about 200 MV ripple. The 22 volts supplies should be within 10% of their rated voltage, and show 1 MV of noise.

To check the chopper waveform:

1. Remove the Output Assembly
2. Switch the Preamplifier to the X10 range
3. Connect the scope to TP1
4. Apply 200 uv to the signal input leads.

The resulting trace should be about 45 MV and should closely resemble drawing 1 on page 3.

To adjust the differential amplifier balance adjustment, proceed as mentioned previously, except the balance control is R302 and the zero adjustment is R7.

The following is a list of component changes since the original design.

1. R203, R206 were 33K 1/4W. These become 33.2K 1% deposited carbon resistors. This change will do much to reduce random noise in the instrument which is not caused by the chopper.

2. R113, R115 were 1.5K 1/4W and become 2.2K 1/4W. This increases the range of the zero adjust potentiometer.

3. R306 was 82K 1/4W and becomes 6.8K 1/4W. This offers more symmetry to the differential pair Q301, Q303 and consequently reduces drift under heat.

4. R415 was 100Ω 1/4W and becomes 27Ω 1/4W. This increases the output voltage of the coil supply to improve operation under low line conditions.

5. Although the Range Control Assembly does not contribute to the stable operation of the preamplifier proper, there are several changes which improve up and down ranging. They are:

    a. R512. This should be 820Ω 1/4W.

    b. R515 in 6812B - R516 in 6869B. This was 10M and becomes 5.6M 1/4W.

    c. C506 was .047 uf and becomes .22 uf/50V.

    d. C507 was .33 uf and becomes .47 uf/50V.

The unijunction transistor Q504 was a 2N2647 in the early production. G.E. transistor 4JD5E29 and 4JX5E738 are direct replacements, and 4JX5E738 is used in current production.

## 6980B

The 6980B is a combination DC Preamplifier, Ohms Converter and AC Converter. It has two gain ranges, X10 and X100 on the preamp function. The Carrier Amplifier and Output Amplifier are in use on Ohms and DC Preamplifier functions. Generally speaking, if the preamplifier function is working satisfactorily the Ohms function should also be satisfactory, with the exception that the preamplifier works into essentially an open load (the DVM input) whereas the Output assembly is required to deliver possibly ten milliamperes with excellent linearity in the ohms function.

As in other Preamplifiers, the Power Supply Assembly 69-6116 delivers plus and minus 22 volts, and these voltages should measure within 10% and have a ripple of 1 MV.

The Coil Supply for the various functions is assembled on the Master Circuit Board, and the output is directed to the various functions by transistors Q1, Q2, and Q3. The saturation voltage of a given transistor should be under 1 volt. 2N1309 is a good replacement. The output voltage in any function measured at the collector of a given transistor should be 14 volts. The coil supply also drives the chopper oscillator in the MV and KΩ function.

To check the chopper waveform:

1. Remove the Output Assembly

2. Switch to MV function and set the range sw to 1000 (X10)

3. Connect the scope to C5 (1.0 uf/50V) on the Carrier Amplifier assembly. This is the large capacitor near the upper center of the assembly.

4. Apply 1 MV to the signal input leads. The resulting trace should be about 60 MV, and should closely resemble drawing 1 on page 3.

The range of the zero adjust front panel potentiometer R7 is 90 digits on the 100 range, therefore, to set R7 to the electrical center, adjust it 45 digits from one of its extremities.

To adjust the differential amplifier balance potentiometer R12 which is located on the Output Amplifier assembly, set the MV front panel zero adjust potentiometer R7 to its electrical center as outlined in the preceding paragraph, set the range switch to 100, the DVM function to MV, and adjust R12 for zero on the DVM.

R10 and R11 on the output amplifier assembly should be 27Ω and 6.8K respectively.

The principal problems in the 6980B occur in the output amplifier assembly. When the 6980B is used in KΩ function, the output of this assembly is connected directly to the red input lead. Under this condition if a DC voltage is applied to the red and black leads by mistake, this voltage is forced between the Output and COM on this assembly. When this is done, it almost always destroys Q5, Q4, Q1, CR4, 5, 6, 1, 2, and one or both of C2 & C3, and sometimes CR7701 on the MV/Ohms Attenuator.

## 6880

The 6880 DC Preamplifier is unique in that the attenuator chopper, amplifier, demodulator and output amplifier are contained on one etched board.

The Power Supply is on a separate assembly. Although the power supply has four output voltages available, three only are used to power the 6880. As in the previously discussed preamplifiers these voltages are plus and minus 22 volts which should have no more than 1 MV ripple, and -20 volts to drive the chopper oscillator.

In order to disable the feedback circuit to check the chopper waveform, a different procedure must be followed as all circuitry is on the one assembly. This can be done quite readily by grounding the feedback circuit.

To check the chopper waveform, proceed as follows:

1. Set DVM to MV function and the range to 10.

2. Connect a jumper across R24. This is the resistor at the top front of the assembly. This will disable the feedback loop.

3. Connect a scope to TP1.

4. Apply 100 uv to the signal input leads.

The resulting trace should be about 30 MV, and should appear similar to drawing 1 on page 3.

To adjust the differential amplifier balance adjustment R56, the front panel zero control adjustment R44 must be disabled and this can be done by connecting a short jumper from the inside of R27 (10M) to the chopper mounting bracket (COM). Set the preamplifier to maximum gain (10 MV; X1000) and short the input leads. Adjust R56 for zero on the DVM.

CIMRON DIVISION
LEAR SIEGLER, INC.
152 MORENA BOULEVARD SAN DIEGO, CALIFORNIA 92110 A.C. 714 • 276-3200

December 21, 1964 | FIELD SERVICE BULLETIN | Issue 105

To: All customers with Cimron Model 6700A AC Converter.

Instrument Affected: All Model 6700A AC Converters serial number 2403 and below.

Reason for Issuance: To increase maintenance information by including corrective measures for high voltage arc-over, if it should occur.

Action Required: Note contents and file with 6700A AC Converter Instruction Manual.

Wafer D has been added to switch S1 to eliminate high voltage arc-over. The 4-wafer switch is available from Cimron as part number 8-64038.

(1) Wiring connected to C1 section is changed to D1 section.

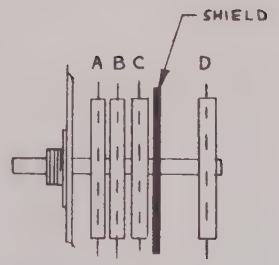
(2) Wiring connected to B1 section is changed to C1 section; wiring connected to B2 section is changed to C2 section; and wiring connected to B3 section is changed to C3 section.

(3) Wiring connected to A2 section is changed to B2 section.

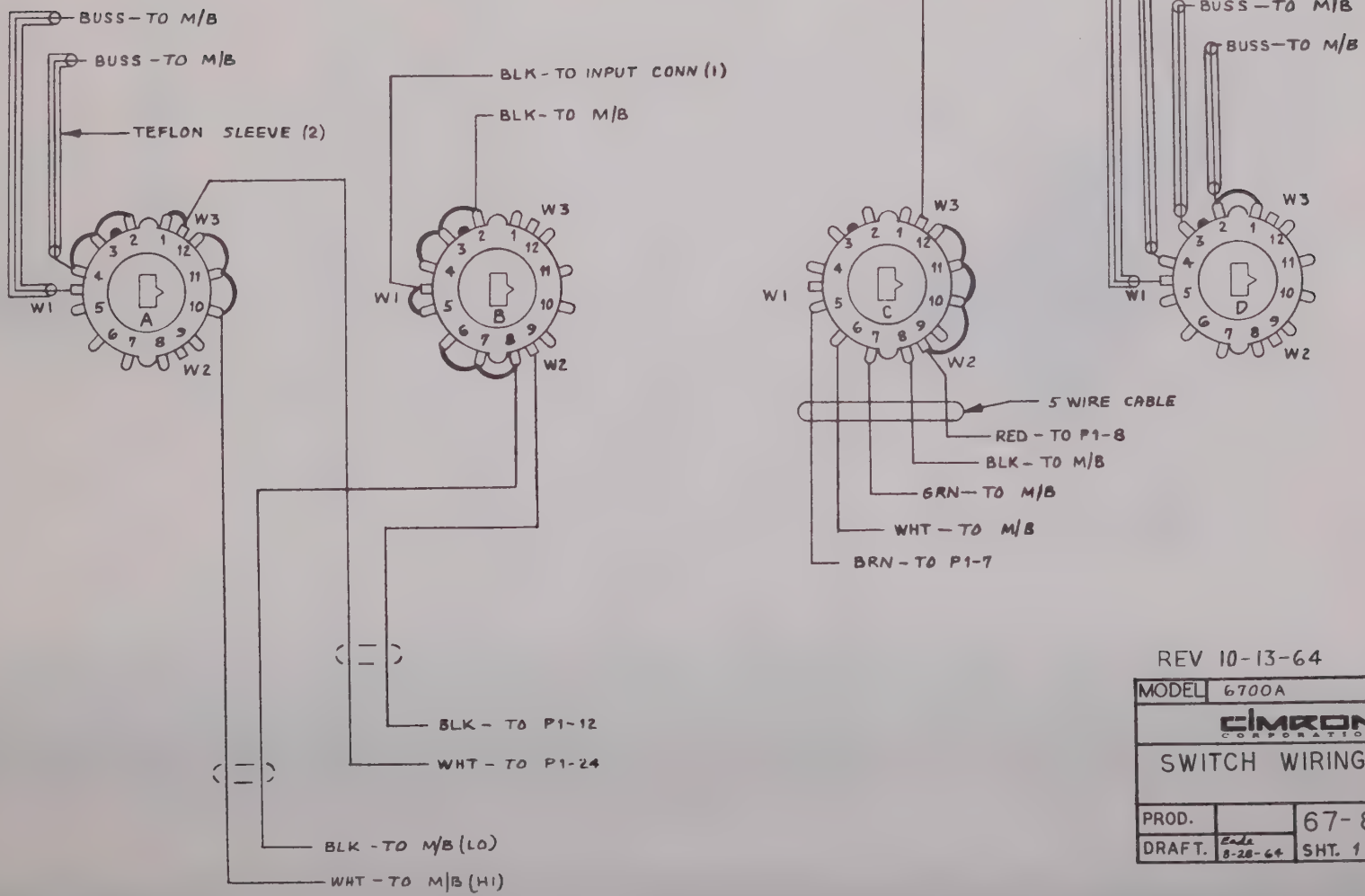
(4) Drawing 67-8000, sheet 1 shows the proper connections to the 4-wafer switch. Drawing 67-8000, sheet 3 is included to aid in identification of switch wiring.

This change will cure high voltage arc-over but should be performed only if high voltage arc-over is indicated or if replacement of switch S1 becomes necessary for any reason.

Donald C. Meyer
Customer Service Supervisor

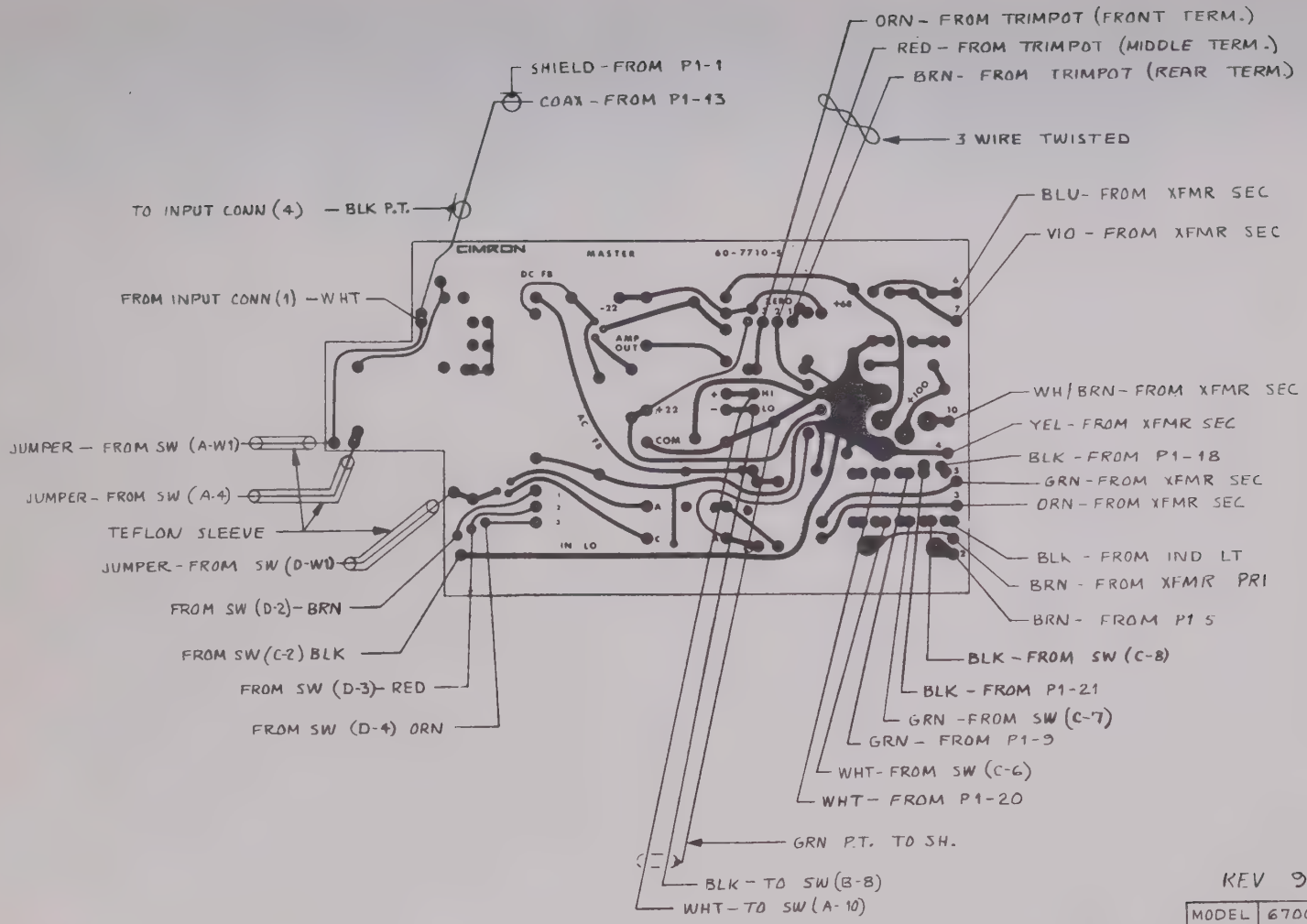



P/N 8-64038




REV 10-13-64

| | |
|---|---|
| MODEL | 6700A |
| CIMRON CORPORATION | |
| SWITCH WIRING – | |
| PROD. | 67-8000 |
| DRAFT. Ende 8-28-64 | SHT. 1 OF 4 |


ORN - FROM TRIMPOT (FRONT TERM.)
RED - FROM TRIMPOT (MIDDLE TERM.)
BRN - FROM TRIMPOT (REAR TERM.)
3 WIRE TWISTED
SHIELD - FROM P1-1
COAX - FROM P1-13
TO INPUT CONN (4) — BLK P.T.
BLU - FROM XFMR SEC
VIO - FROM XFMR SEC
CIMRON
MASTER
60-7710-5
FROM INPUT CONN (1) — WHT
WH/BRN - FROM XFMR SEC
YEL - FROM XFMR SEC
BLK - FROM P1-18
GRN - FROM XFMR SEC
ORN - FROM XFMR SEC
JUMPER — FROM SW (A-W1)
JUMPER - FROM SW (A-4)
TEFLON SLEEVE
JUMPER - FROM SW (D-W1)
BLK - FROM IND LT
BRN - FROM XFMR PRI
BRN - FROM P1 5
FROM SW (D-2) - BRN
FROM SW (C-2) BLK
BLK - FROM SW (C-8)
FROM SW (D-3) - RED
BLK - FROM P1-21
GRN - FROM SW (C-7)
FROM SW (D-4) ORN
GRN - FROM P1-9
WHT - FROM SW (C-6)
WHT - FROM P1-20
GRN P.T. TO SH.
BLK - TO SW (B-8)
WHT - TO SW (A-10)

REV 9-22-64

| | | |
|---|---|---|
| MODEL | 6700A | |
| CIMRON CORP | | |
| MASTER BOARD - WIRING | | |
| PROD | | 67-8000 |
| DRAFT | Earle 8-31-64 | SH 3 OF 4 |

CIMRON DIVISION
LEAR SIEGLER, INC. / LSi
52 MORENA BOULEVARD SAN DIEGO, CALIFORNIA 92110 A.C. 714 • 276-3200

November 22, 1965 FIELD SERVICE BULLETIN Issue 108

To: All Customers with Cimron Model B Accessories

Instruments Affected: 6700B, 6701B AC-DC Converters, 6801B, 6802B DC Pre-amplifiers, 6911B Ohms-DC Converter, 6930B High Voltage Module, and 6980B Multimeter Converter.

Reason for Issuance: Elimination of possible shock hazard.

Action Required: Perform indicated wiring on indicated instruments, file with maintenance information and Instruction Manual.

All listed instruments should have the front panel grounded to the DVM case. This may be accomplished in the following manner:

(1) remove paint from counter sink in panel hole of upper right panel mounting screw,

(2) mount a solder lug under nut on upper right panel mounting screw as shown in figure 1,

(3) connect a 22 gage wire from solder lug to pin 23 on connector P1A as shown in figure 2.

Donald C. Meyer
Customer Service Supervisor

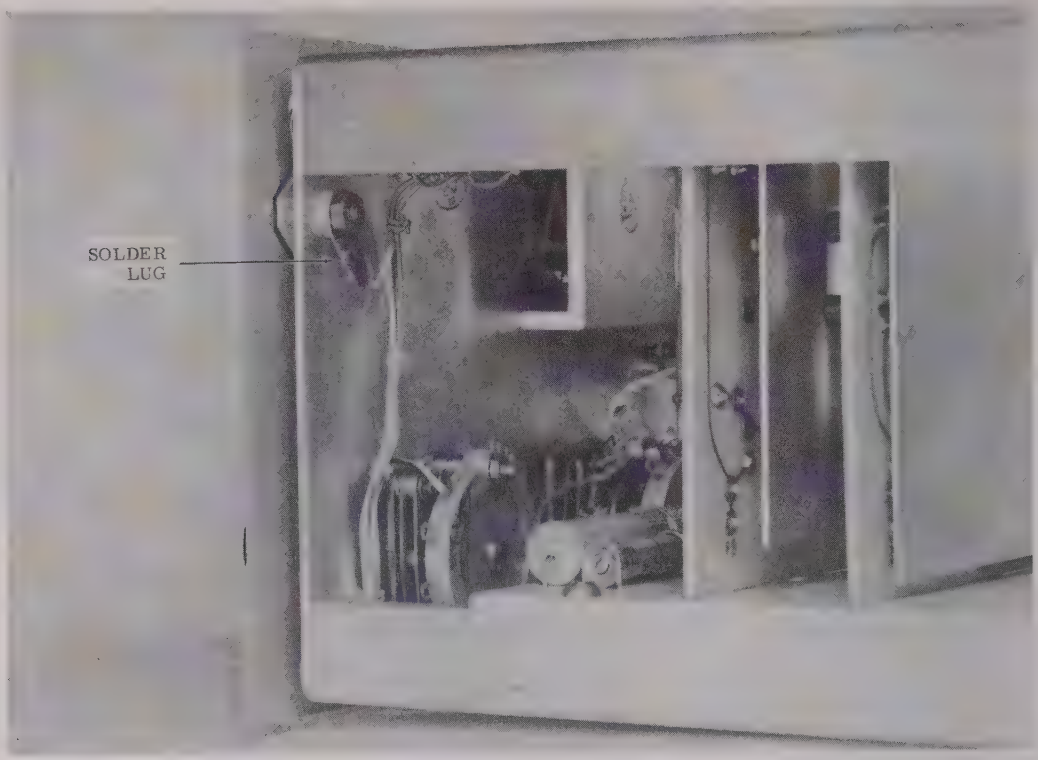



Figure 1.

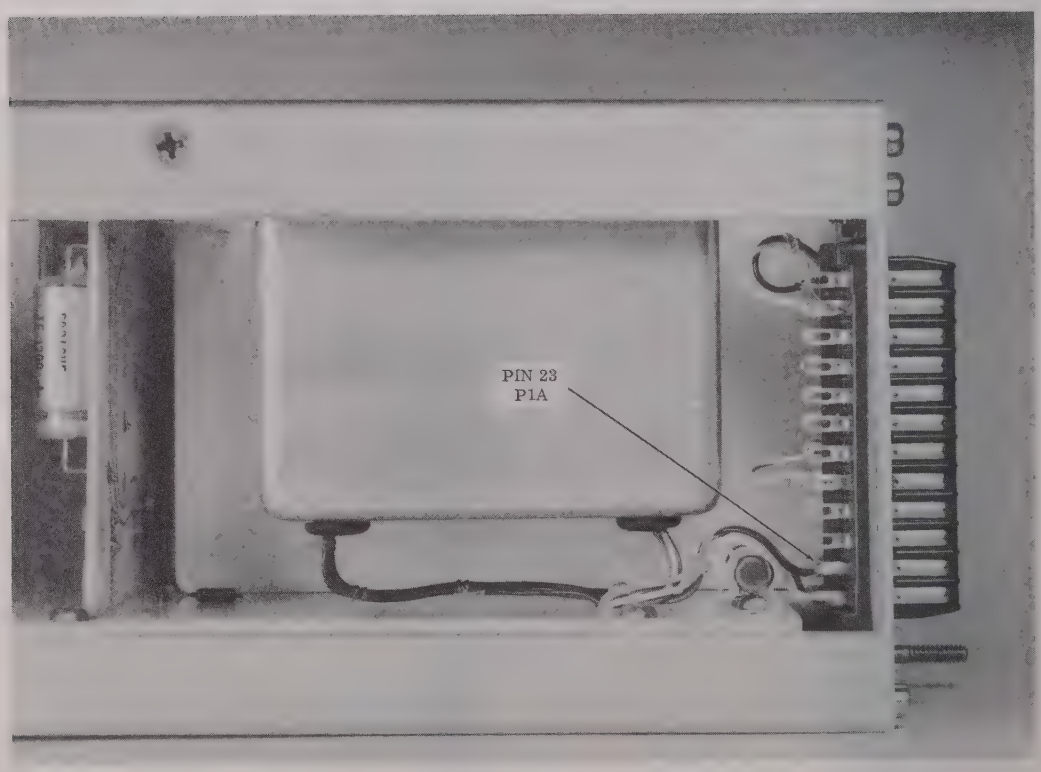



Figure 2.

CIMRON DIVISION
LEAR SIEGLER, INC. / LSi
1152 MORENA BOULEVARD SAN DIEGO, CALIFORNIA 92110 A.C. 714 • 276-3200

April 14, 1965 | FIELD SERVICE BULLETIN | Issue 109

To: All Customers with Model 6980B Multimeter Plug-in Accessory

Instrument Affected: 6980B Multimeter Plug-in and all mods -356, -505

Reason for Issuance: Maintenance information and corrections to Manual Parts Lists

Action Required: Note maintenance information. Correct part numbers in Manual Parts Lists.

AC RECTIFIER AND FILTER ASSEMBLY 69-6083

Capacitors C8304, C8305, C8306, and C8307 have been changed to Polycarb 0.47 uf 100V. The change is in the parts lists in the Instruction Manuals. However, some of the older units still have metal mylar capacitors installed. These capacitors should be replaced, as needed, with the correct polycarb components.

CARRIER AMPLIFIER ASSEMBLY 69-6078

In the parts list of the Instruction Manual change the entry REED, RELAY SPST GOLD MRG-1 to read REED, RELAY SPST GOLD MR-306-8 Part Number 7-38216. When the reed relay S7801 is changed or replaced, be sure replacement is type MR-306-8 as indicated.

OHMS MILLIVOLT ATTENUATOR ASSEMBLY 69-6077
INPUT-OUTPUT ASSEMBLY 69-6078
AC ATTENUATOR ASSEMBLY 69-6081

When reed relays are changed or replaced, be sure replacement is type MR-306-8 as indicated in respective Parts Lists.

Donald C. Meyer
Customer Service Supervisor

# CIMRON "BLACK BOX" DESCRIPTION

Each Field Engineer carries with him what is commonly referred to as a Cimron "Black Box".

A great number of lab technicians have shown interest in our "Black Box", and many have expressed a desire to build one.

Normal precautions with shielding, etc. must be observed, and the builder should be in possession of liberal amounts of patience.

The Cimron "Black Box" is a stable, accurate DC source with a 10V capability and infinite resolution. It consists of a zenered reference supply which drives a Kelvin-Varley potentiometer and the least significant decade is a ten turn potentiometer. Experience has proven that the voltage output is within .01% of absolute within ten minutes from turn-on, and within 100 uv of full scale after 1/2 hour warmup.

It is used

1. To adjust up and down sensitivities in all Cimron DVM's and those of other manufacture having an input resistance of 1 KMΩ or greater.

2. To check major and minor transfers. This is possible as the resistors used in the attenuator are at least as good as those used in a DVM.

3. To check Polarity offset.

4. To check Ratio, both polarities.

5. To check DC Preamplifiers and to give an approximate calibration of these.

6. To check systems. This is important as very often the use of the "Black Box" may determine that problems lie in the voltage source driving the system, and not in the DVM.

7. To trace ground loops.

8. To check the input resistance of a DVM.

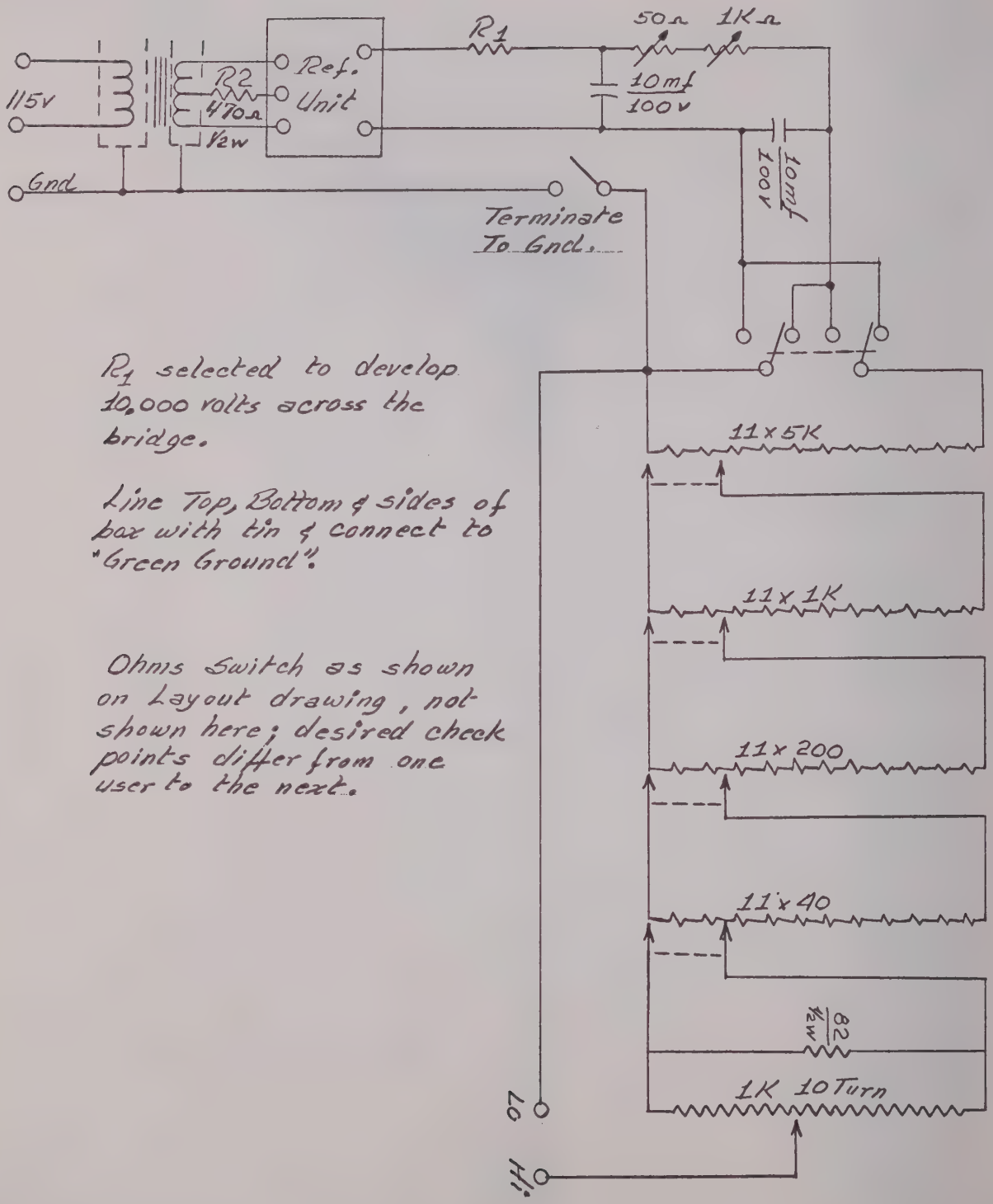
There are no limitations on the physical construction. It can be designed for bench use in which case the size or weight is not important, or it can be made small physically and so be completely portable. However, the entire unit must be shielded and the shield connected to green earth ground. A switch should be included to connect the signal low to the shield if required. A small trimmer capacitor of 10 mfd maximum should be connected from signal low to one side of the transformer secondary, and it should be adjusted for minimum ripple with negative high output. Which side of the transformer is used will have to be determined experimentally.

# PRICE LIST FOR "BLACK BOX"

| QUANTITY | PART NUMBER | ITEM | UNIT PRICE | EXTENDED PRICE |
|---|---|---|---|---|
| 1 | 9-01011 | Transformer | $13.95 | $13.95 |
| 11 | 7-47502 | Resistor, WW, 5K, 0.01% | 4.23 | 46.53 |
| 11 | 7-47102 | Resistor, WW, 1K, 0.025% | 3.25 | 35.75 |
| 11 | 7-47201 | Resistor, WW, 200Ω, 0.1% | 2.40 | 26.40 |
| 11 | 7-47400 | Resistor, WW, 40Ω, 1% | 2.23 | 24.53 |
| 1 | 7-49201 | Resistor, Variable, 10 Turn, 1K | 23.75 | 23.75 |
| 4 | 69-0505-3 | Switch, 2 Pole 10 Position (Modify) | 12.50 | 50.00 |
| 2 | 1-57341 | Capacitor, Mylar, 10 ufd, 100V | 6.43 | 12.86 |
| 1 | | Switch, Toggle, DPDT | Local Purchase | |
| 1 | | Resistor, Comp, 82Ω, 1/2W, 5% | Local Purchase | |
| 1 | 7-54211 | Resistor, Trimpot, 1KΩ | 6.65 | 6.65 |
| 1 | 7-54219 | Resistor, Trimpot, 50Ω | 10.70 | 10.70 |
| 1 | | Case, Allied #87Z886 ($.84) | Local Purchase | |
| 1 | | Panel, Allied #87Z888 ($.60) | Local Purchase | |
| 1 | 2-70000 | Power Cord with Plug | 1.38 | 1.38 |
| 1 | #1201 | Voltage Reference (from Norfax) | 61.00 | 61.00 |

Effective November 1, 1966

# Cimron "Black Box".



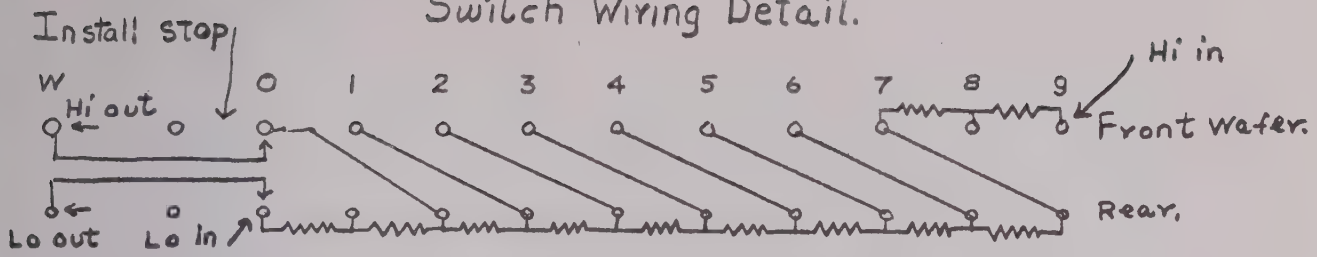

$R_1$ selected to develop 10,000 volts across the bridge.

Line Top, Bottom & sides of box with tin & connect to "Green Ground".

Ohms Switch as shown on Layout drawing, not shown here; desired check points differ from one user to the next.

K.P.
10-14-66

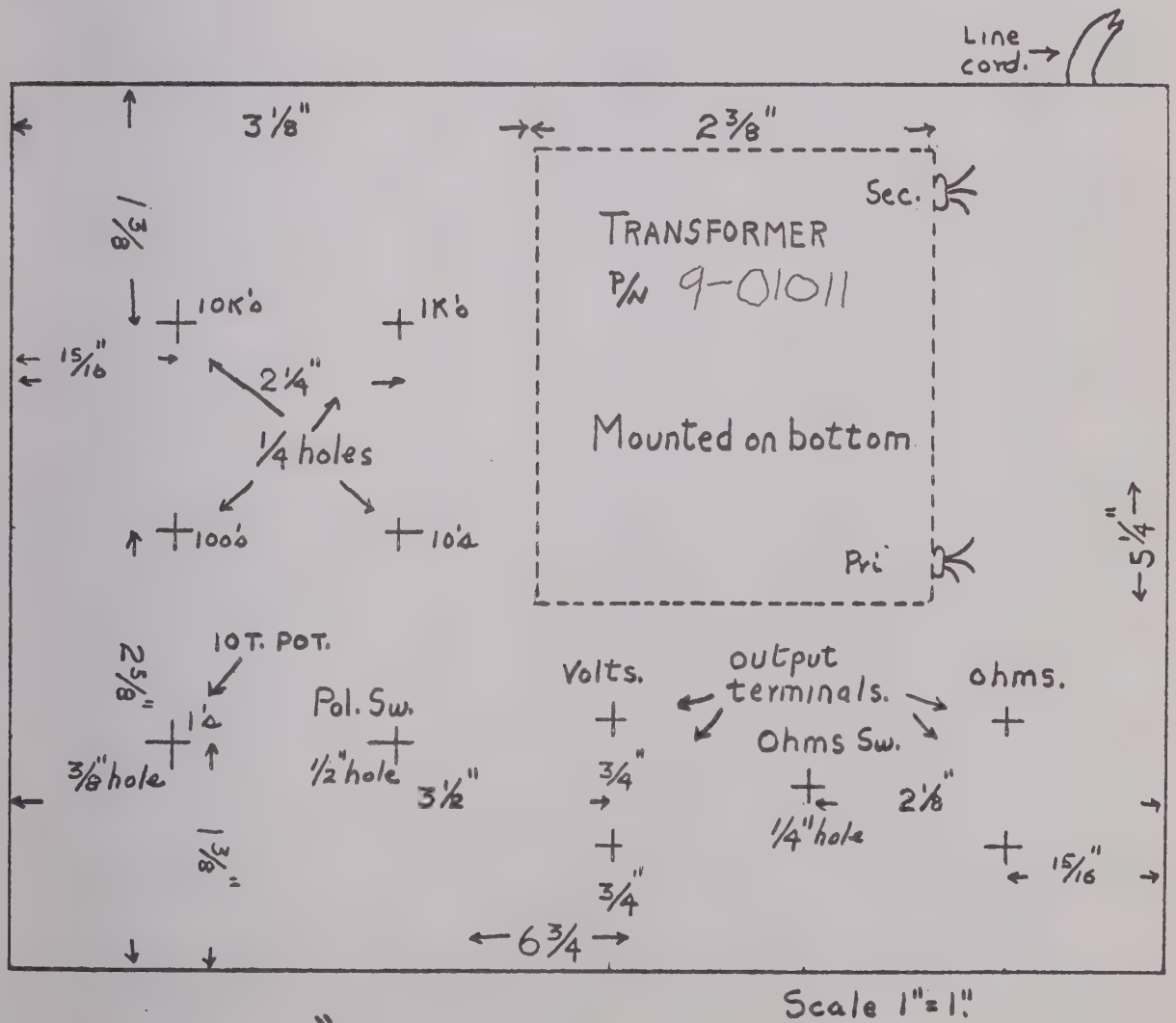
# Switch Wiring Detail.




10K Switch - Eleven 5K Resistors. -.01%

| | | | | | |
|---|---|---|---|---|---|
| 1K | " | - | " | 1K | " |
| 100's | " | - | " | 200Ω | " |
| 10's | " | - | " | 40Ω | " |

Unit's Switch is a Ten Turn Pot shunted by approximately 85Ω.




# "Black Box"

## Layout and Switch Wiring Detail.

10/14/64 R.M.

## ZENERS USED IN CIMRON PRODUCTS

| | Voltage | Tol. | Diss. | Test I | Z |
|---|---|---|---|---|---|
| 1N708A | 5.6V | 5% | 250MW | 25 MA | 3.6Ω |
| 1N710A | 6.8V | 5% | 250MW | 25 MA | 4.7Ω |
| 1N712 | 8.2V | 10-20% | 250MW | 25 MA | 6Ω |
| 1N712A | 8.2V | 5% | 250MW | 25 MA | 6Ω |
| 1N714A | 10V | 5% | 250MW | 12 MA | 8Ω |
| 1N716A | 12V | 5% | 250MW | 12 MA | 10Ω |
| 1N717A | 13V | 5% | 250MW | 12 MA | 11Ω |
| 1N718A | 15V | 5% | 250MW | 12 MA | 13Ω |
| 1N719 | 16V | 10-20% | 250MW | 12 MA | 15Ω |
| 1N720A | 18V | 5% | 250MW | 12 MA | 17Ω |
| 1N722A | 22V | 5% | 250MW | 4 MA | 24Ω |
| 1N722 | 22V | | 250MW | 4 MA | 24Ω |
| 1N723A | 24V | 5% | 250MW | 4 MA | 28Ω |
| 1N746A | 3.3V | 5% | 400MW | 20 MA | 28Ω |
| 1N750 | 4.7V | | 400MW | 20 MA | 19Ω |
| 1N752 | 5.6V | | 400MW | 20 MA | 11Ω |
| 1N938 | 9V | 5% | 500MW | 7.5 MA | 20Ω |
| 1N945 | 11.7V | 5% | 500MW | 7.5 MA | 30Ω |
| 1N957A | 6.8V | 5% | 400MW | 19 MA | 4.5Ω |
| 1N965A | 15V | 5% | 400MW | 8.5 MA | 16Ω |
| 1N969A | 22V | 5% | 400MW | 5.6 MA | 29Ω |
| 1N971B | 27V | 10% | 400MW | 4.6 MA | 44Ω |
| 1N972B | 30V | 10% | 400MW | 4.2 MA | 49Ω |
| 1N973B | 33V | 10% | 400MW | 3.8 MA | 58Ω |
| 1N3030B | 27V | 10% | 1 W | 9.5 MA | 35Ω |
| 1N3033A | 36V | 5% | 1 W | 7 MA | 50Ω |
| 1N3042A | 82V | 5% | 1 W | 3 MA | 200Ω |

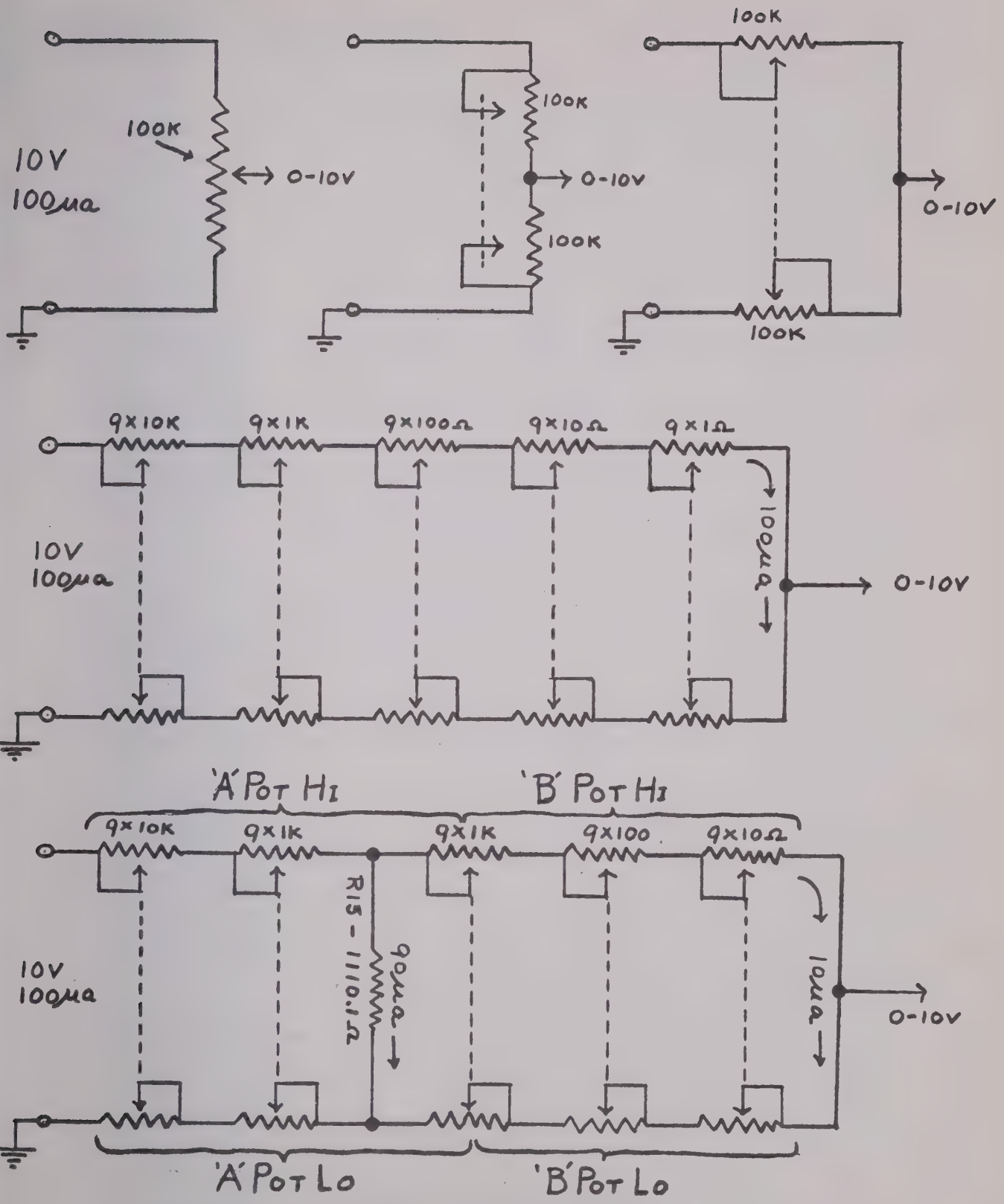
## CD DIODES

| | | |
|---|---|---|
| CD-61 | $I_f$ 1V greater than 100 ma/ $I_r$ 75V less than 1 ua | Silicon |
| CD-62 | $I_f$ 1V greater than 100 ma/ $I_r$ 300V less than 6 ua | Silicon |
| CD-63 | $I_f$ 1V greater than 15 ma/ $I_r$ 30V less than 100 ua | Germanium |

## TRANSISTORS: Nearest Commercial Replacement

CT-20 2N697; CT-21 2N2222; CT-22 2N3114; CT-23 2N697;
CT-24 2N3114; CT-25 2N3114; CT-26 2N2222; CT-31 2N1131

Effective November 1, 1966




Evolution of Wolff Potentiometer.

3.15.65
R.M.

CIMRON DIVISION
LEAR SIEGLER, INC.
52 MORENA BOULEVARD SAN DIEGO, CALIFORNIA 92110 A.C. 714 • 276-3200

January 12, 1965 | FIELD SERVICE BULLETIN | Issue 107

To: All Customers

Instruments Affected: 6000A Series, 7000A Series, 8000B Series Instruments containing Assemblies listed below.

Reason for Issuance: Future replacement of all CT-21 transistors with CT-26 transistors.

Action Required: Correct parts lists in Instruction Manuals. Assemblies affected are listed below, with instrument numbers.

Delete transistor CT-21, Cimron part number 9-04702, in all listed parts lists and schematics. Where CT-21 is deleted from a listed parts list or schematic, insert CT-26, Cimron part number 9-04710.

LIST OF AFFECTED INSTRUMENTS AND ASSEMBLIES

| INSTRUMENT | ASSEMBLY |
|---|---|
| 6000A Series Digital Voltmeters<br>6000A Series Digital Volt-Ratio Meters | 60-6018 Amplifier and Gate |
| 6700A AC-DC Converter<br>6701A AC-DC Converter | 60-6712 Amplifier<br>Master Circuit Board Schematic 60-0787<br>Master Circuit Board Schematic 60-0790 |
| 6801A DC Preamplifier<br>6802A DC Preamplifier | 60-6813 Output Amplifier<br>60-6814 Oscillator |
| 6801B DC Preamplifier<br>6802B DC Preamplifier | 60-6110 Oscillator<br>60-6109 Output Amplifier |
| 6910A Ohms Converter<br>6911A Ohms Converter | 60-6902 Carrier Amplifier<br>60-6903 DC Amplifier<br>60-6905 Oscillator |



ELECTRONICS FOR MEASUREMENT - CONTROL - AUTOMATION

LIST OF AFFECTED INSTRUMENTS
AND ASSEMBLIES

| INSTRUMENT | ASSEMBLY |
|---|---|
| 6911B Ohms Converter | 69-6002 Carrier Amplifier<br>69-6003 DC Amplifier<br>69-6004 Reference<br>69-6005 Oscillator |
| 7000A Series Digital Voltmeters<br>7000A Series Digital Volt-Ratio Meters | 70-6009 Amplifier |
| 7400A Digital Voltmeters<br>7500A Digital Volt-Ratio Meters<br>7500A-162 Digital Volt-Ratio Meters | 70-6014 Print Control |
| 8000B Series Digital Voltmeters<br>8000B Series Digital Volt-Ratio Meters | 80-6010 Reference |

Donald C. Meyer
Customer Service Supervisor

CIMRON DIVISION
LEAR SIEGLER, INC.
1152 MORENA BOULEVARD SAN DIEGO, CALIFORNIA 92110 A.C. 714 • 276-3200

May 13, 1965 FIELD SERVICE BULLETIN Issue 113

To: All Customers

Instruments Affected: All

Reason for Issuance: Future replacement of all 2N382 transistors with 2N526 transistors.

Action Required: Note maintenance information and parts replacement.

The 2N526 transistor, Cimron part number 9-04616 is a direct replacement for all 2N382 transistors, Cimron part number 9-04600. The 2N526 transistor is to be used whenever a 2N382 transistor requires replacement.

Donald C. Meyer
Customer Service Supervisor

CIMRON DIVISION

LEAR SIEGLER, INC. / LSi

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